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MUNICIPAL DISINFECTION IN NEW YORK CITY AS RECENTLY REORGANIZED

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BRIEF RESUMÉ OF FORMER METHODS OF DISINFECTION IN NEW YORK CITY

Sulphur was the standard material used for the disinfection of rooms up to 1895, four pounds of roll sulphur being burned to disinfect 1000 cu. ft. of space. This was gradually discarded in favor of formaldehyde gas in 1902. At first this was generated from formalin by heat from a flame, later a combination of a solution of formaldehyde, aluminium sulphate solution and lime was utilized; one pound of lime (fresh unslaked granular) being allowed for every 1000 cubic feet of space. Over this was poured a mixture of six ounces of formaldehyde, 40 % strength, and two ounces of a saturated solution of aluminium sulphate; a fairly rapid evolution of the gas resulted.

This method was open to several objections, one of the most important being the excessive weight of the materials, another was the irregularity of results. The conditions in New York City required that the disinfectors should carry by hand the chemicals and necessary utensils required for disinfection, and the weight of this material amounted to 25 lbs. for every 10 disinfections of 1000 cu. ft. of space. It was therefore necessary to adopt or devise some combination of chemicals which would prove satisfactory for the purposes of municipal disinfection. In all, some 55 formulae were tested; first, as to the efficiency, second, as to the time required for a compound to disinfect properly; third, as to the cost; fourth, as to the danger

of fire; fifth, as to ease of transportation; the last factor being important owing to the frequent long distance from the base of supplies.

(a) Technique Employed. The limit of time selected was 4 hours. This period having been found to impose the least hardship upon the many people whose small apartments require disinfection and who frequently have to spend that time in the parks and streets. The method of testing the effectiveness of disinfection was by means of threads, dipped in 24 hour cultures of B. coli and B. pyocyaneus dried in air and placed on cards according to the Wilson Method, or in tissue paper envelopes. After the test, these threads were immediately removed with sterile forceps and placed in test tubes containing a suitable medium; B. coli in lactose neutral red fermentation tubes, and B. pyocyaneus in the synthetic medium later described. These tubes were then incubated at 37 degrees C. for three days after which readings were made.

The formulae can be grouped as follows:—

1. Mixtures of lime, postassium permanganate and formaldehyde and different salts in varying proportions.

2. Potassium permanganate, and formaldehyde in different proportions.

3. Potassium permanganate, sand and formaldehyde in different proportions.

4. Potassium permanganate, paraformaldehyde and water in different proportions.

5. Solidified formaldehyde and heat.

The standards of efficiency, time limit, cost and weight eliminated the greater part of these formulae.

(b) Preliminary Tests. Many of the combinations were given preliminary trials to note any possible defects in chemical reaction, bulk and cost, and some of those rejected for any of those reasons are grouped together in Table one.

TABLE 1.

Formulae rejected after preliminary trial

Lime	Potassium Permanganate	Formaldehyde	Water
Ounces per 1000 cubic feet	Ounces per 1000 cubic feet	Ounces per 1000 cubic feet	Ounces per 1000 cubic feet
5	2.5	5.1	5.1
4.8	2.5	5.1	5.1
	9	10	5
	8	10	5
	10	7	3.5
	20	6	3

A series of experiments were also tried in which sand was used as a mechanical means of checking the violent reaction of the potassium permanganate but the formulæ were rejected as too much formaldehyde was retained in the residue.

(c) Final Tests. Those compounds which passed the preliminary trial were then tested in room disinfection and sub-divided again as follows:—

1. Compounds which required five to six hours to complete the destruction of the testing organism, but fulfilled the requirements as to weight, cost, etc. (Table two).

TABLE 2.

Formula giving good result in 6 hours time

Test 1. Material per 1,000 cu. ft.	Ounces.	
$K_2Mn_2O_8$	5	Tested May 29th, 1910.
CHOH	6.8	Amount of gas set free by this method, 41%.
H_2O	2.5	Volume of gas tested by Lockerman's & Kroner's apparatus.
Lime	2.5	Size of room 1129 cu. ft. of space, time 6 hrs.
		24 hrs. cultures of B. pyocyaneus B. coli used on threads in envelopes.

Cultures	Growth	No growth	
B. pyocyaneus	..	10	Total number of tests exposed, 20
B. coli	..	10	Number of tests showing growth
B. pyocyaneus..	5		Number of tests not showing growth 20-100%
B. coli			

As this formula seemed to meet all the requirements except the time limit, it was repeatedly tested in rooms of different size to ascertain if this factor could not be reduced, but without any change in the results.

2. Those compounds which resulted in the destruction of the testing organism after four hours exposure, but were rejected on account of excessive weight, cost, etc. (Table three).

TABLE 3.

Formulæ giving good results in 4 hour room disinfection, rejected on account of excessive weight, cost, etc.

No. of Ounces	Lime	Potassium Permanganate	Formaldehyde	Water	Oxalic Acid 1/10
Test	Ounces per 1000 cubic feet	Ounces per 1000 cubic feet	Ounces per 1000 cubic feet	Ounces per 1000 cubic feet	Ounces per 1000 cubic feet
		20	20	10	
		10	9	45	
	10	5	10	5	5
	8	7	5	10	5
	3	3.05	5.6	3	
	6		5	5	5

Other mixtures having a reduction of 20% in the amount of potassium permanganate or of 10% of the formaldehyde and water gave equally good results but had the same objections.

3. Those compounds which brought about a successful disinfection in four hours time and were otherwise satisfactory. (Table four).

TABLE 4.

Compounds Causing Death of the Testing Organism in Four Hours and Meeting all the Requirements, as to Cost, Ease of Transportation, etc.

FORMULA 1.

Potassium permanganate	30 grammes or 1 ounce.
Paraformaldehyde	75 grammes or 2.5 ounces.
Water	90 grammes or 3 ounces.

FORMULA 2.

Fumigator Compound.
Solidified Formaldehyde.
Carbolic Acid.
Glycerine, etc.

In this last division there were only two compounds to be tested; first, a mixture of paraformaldehyde, potassium permanganate and water; and second, a solidified formaldehyde compound, consisting of formaldehyde, carbolic acid, glycerine and other chemicals; the compound being volatilized by the aid of a flame.

At this time also an extended series of analyses were made for the purpose of ascertaining the amount of formaldehyde gas evolved by these various compounds, as well as the amounts remaining in the residue. Thanks are due to Dr. Banzhaf and Miss B. Junger for their aid in this direction. The evolution of gas was tested by the Lockerman and Kroner method, and

also by means of the Kjeldahl flask. The residues were also tested for the amount of residual formaldehyde. A large number of tests were made and the conclusions drawn were as follows.

1st. That in the lime, aluminium sulphate and formaldehyde method of disinfection the evolution of gas is less complete than has generally been supposed. This also holds good for the potassium permanganate, and liquid formaldehyde method.

2nd. That with the paraformaldehyde and permanganate method the results obtained were more satisfactory, the amount of gas evolved running as high as 87%.

The method of testing residue for residual formaldehyde. After the evolution of gas had ceased, the residue was carefully weighed and thoroughly mixed; 50 gms. were then taken and washed thoroughly with water, filtered and the filtrate diluted to 500 c.c. with distilled water. Of this dilution 20 c.c. were taken for analysis, and tested according to the iodine—thio-sulphate method, in order to ascertain the amount of formaldehyde present. The remainder of the residue was then dried by means of a water bath and desiccator, the loss in weight noted, and from the resulting figure the amount of formaldehyde present in the entire residue calculated. Records of the results of some of the tests are given in the pages at the end of the section.

Much work has recently been done both here and abroad, with combinations of paraform and potassium permanganate and water. Lockerman and Kroner have done considerable work in this direction. In testing the paraformaldehyde permanganate method for municipal disinfection we found that the following amounts of the chemicals made a good mixture and gave sufficient formaldehyde to disinfect test-threads in 1000 cubic feet of space in four hours time.

Paraformaldehyde	30 grammes
Potassium Permanganate	75 grammes
Water	90 grammes

The two chemicals are put up separately in small boxes containing sufficient material to disinfect 1000 cubic feet of space, and carried by the disinfector to the infected house. Here the two chemicals are thoroughly mixed in small deep tin pans (½ quart size), then the water is added and the mixture again thoroughly stirred. The evolution of gas is comparatively slow in starting, and this gives the disinfector time to leave the room and seal the door properly without being annoyed by the fumes of formaldehyde. The evolution of gas is practically completed in 5 to 10 minutes.

The second method which was found most excellent in many respects was carried out by means of a fumigator. This fumigator consists of a

receptacle or deep cup containing a layer of paraffine and a circular wick to which air is admitted through spaces cut in the sides. In the upper part of this receptacle another cup containing 48 grammes of the mixture of solidified formaldehyde is placed. The candle when ignited is set in a shallow pan containing cold water. The evolution of gas takes place with quiet bubbling, the entire process being completed in one half hour.

Both of these methods show distinct advantages over that formerly in use; first, on account of the greater amount of gas evolved; second, because of the light weight of the chemicals used, thus giving a better disinfection and avoiding one of the great objections to the former method where a disinfector had to carry from 50 to 100 pounds, often returning for as much more in order to complete a day's work.

The following table of ten disinfections of 1000 cubic feet of space illustrates the difference in weight of outfits to be carried.

1. Lime and Formaldehyde Method		2. Paraform and Permanganate Method		3. Fumigator Method
Lime	10 lbs.	Paraform	10 oz.	
Formaldehyde and Al. Sulp. Sol.	6.25 "	Potas. Permang.	25 "	2.6 lbs.
Pans	.5 "			
Cartons	1.35 "	Cartons	3.33	
Bottles for carrying Sol.	2.5 "	Pans	13	
			51.4 oz. 3.21 lbs.	
Total	20.26 lbs.			

In any method of disinfection involving the use of heat, one of the most important considerations is of course the avoidance of the risk of fire. In our experiments many methods were rejected on this ground alone, and this was one of the most important factors determining the final choice of a routine method. A slight risk of this kind is attached to combinations of paraformaldehyde and potassium permanganate, but the advantages of such a combination are so obvious that it is worth while to find some means by which it can be used with safety. The Germans found that intense heat was evolved by pouring small quantities of water upon large masses of paraform and permanganate, thus bringing about very rapid action, but at the same time producing a vivid flame. They guard against this danger by first mixing together the permanganate and water to which soda is added in small quantities, and last of all the paraformaldehyde. They, further, recommend the use of small vessels for containers, thus dividing the charge, and effectually guarding against any danger from fire which might otherwise be present.

As the result of the work of others and the investigations reported here, the Board of Health decided in October 1910 to adopt the paraform permanganate method for their routine room disinfection and this method has been utilized with satisfactory results during 1911. The tests are given in detail at the end of this article.

Book-Disinfection. A question raised in the course of these experiments was as to the efficiency or the methods usually applied to the disinfection of books; the opinion having been prominently advocated by some not familiar with previous investigations that the complete destruction of books is necessary after contact with a contagious disease. It was thought best therefore to make a series of experiments to re-test this matter. The method in common use consists of the exposure of books or papers to formaldehyde, gas-formaldehyde, gas and heat or heat alone.

The following work was planned and carried out as follows:—

1. Exposure of books inoculated with bacteria to formaldehyde, alum. sulphur and lime method and heat in varying amount for 3 hours.

2. Exposure of books inoculated with bacteria to formaldehyde, aluminum, sulphur and lime method at room temperature 24 hours.

3. Exposure of books inoculated with bacteria to the action of dry heat alone at a temperature of 50°-55°C. for 3 hours.

4. Exposure of books inoculated with bacteria to the action of dry heat alone at a temperature of 50°-55°C. for 24 hours.

In this work I was assisted by Miss B. Junger and Miss Schweitzer, assistants at the Laboratory. The books used were ordinary library and school books and the tests were conducted in the following manner; one half of the books were closed and the other half had the covers fastened back so that the gas could penetrate freely. At intervals of ten, twenty or one hundred pages, a page was divided into 4 parts and these parts subdivided into squares, the parts were labeled as follows; upper outer corner, upper inner corner, lower outer corner, lower inner corner; these portions of the pages being most liable to contamination. In the squares thus marked, the surface of the page was directly smeared with a 24 hour culture of B. pyocyaneus and a 24 hour culture of B. coli. In a second square a thread inoculated with similar cultures was fastened with a drop of paraffine. After the tests, these threads were immediately removed with sterile forceps and inoculated into test tubes, the B. pyocyaneus in the synthetic medium and B. coli in lactose neutral red fermentation tubes.

The paper squares were then cut out and dropped into similar tubes and controls were made. All the test tubes were incubated at 37 degrees C. for three days after which readings were made.

CONCLUSIONS.

1. Ordinary routine room disinfection disinfects only the surfaces of exposed pages and covers of books.

2. Reviewing the formaldehyde aluminium sulphate and lime method, it appears that a large quantity of formaldehyde, 44 oz. per 1000 cu. ft., together with heat 50°-55°C., will destroy ordinary bacteria in books in 3 hours time if the books are opened and the leaves spread apart.

12 J—1906 21a-164, '06, 40,000 (P)

Laboratory Number

Date of Test 190

Result

DEPARTMENT OF HEALTH

DISINFECTION TEST

Name

Street

Disease

Disinfector

Test exposed

Test collected

Date of Test 190

Fig. 1.—Folder formerly used.

3. The various tests by heat alone show that a short exposure three hours at 49°-51°C. does not destroy all pathogenic bacteria.

4. A 23 hours exposure at 50° to 55°C. will destroy bacteria but is apt to warp the books by drying them excessively.

5. A three hours exposure at 55°C. to moist heat and formaldehyde will kill the bacteria and beyond a slight spreading of the leaves do no damage to the books.

Controlling Disinfection. The control of disinfection by means of tests is of comparatively recent origin, Koch in 1887 being the first to mention its use. He selected the B. prodigiosus and the B. pyocyaneus and grew them on a potato medium testing disinfection by exposing both culture medium and organism to the action of the disinfectant.

The method of testing disinfection formerly in use in New York City was that known as the Wilson Method having been elaborated by Dr. R. J. Wilson then Assistant Director in the Research Laboratory.

The method depended for its efficiency on the color produced by B. pyocyaneus, when grown in bouillon. The manner of using it was as follows. Fine cords were inoculated with this organism and fastened by means of a drop of paraffine to a folder. (See figure 1). These folders were sent out 2 or 3 times a week to the various boroughs, and distributed to the disinfectors, who placed the opened folders in the rooms to be disinfected, and left them there during the period of disinfection. Upon the completion of disinfection, they were removed by the drivers who called to remove the bedding for steam sterilization and were brought to the laboratory.

Here the threads were removed and placed in broth tubes and incubated for 5 days. They were then examined and those showing the color reaction, were marked positive and a record made. This most excellent method was in use a number of years. It was found, however, that these tests were easily contaminated in the process of handling and might thus lead to unfair deduction, 1st; as to the character of the materials used, 2nd; as to the mode of disinfections; 3rd as to the thoroughness of the process.

Studies were begun in 1908, with a view of obviating those drawbacks. Comparisons were made as to the advantages of envelopes as compared with the cardboard folders for holding the test threads. About 30 different kinds of envelopes were tried, varying in size, form, position of opening, and quality of paper, the latter ranging from tissue to manilla, glazed, unglazed, etc.

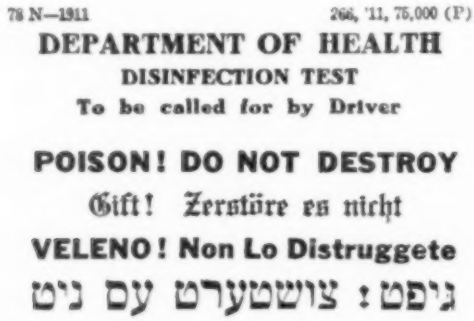
An oblong envelope $4\frac{1}{4}$ x 3″ made of the quality known as French White tissue paper was finally decided upon as affording the best protection from accidental contamination while at the same time, not interfering with the action of the disinfecting gas upon the threads. (See figure two.)

The next step after the choice of the envelopes, was to find some way of obviating the frequent loss or destruction of the tests by foreigners, unacquainted with their importance. For this purpose, the words "Poison, do not destroy" were printed on the outside of the envelopes in large red letters in four different languages. This method of printing has proved so effective that comparatively few tests are now lost or carelessly destroyed. All other necessary data were printed in black ink.

Modification of Medium. Owing to the inhibiting effects produced upon the organisms when these were not entirely killed by the disinfecting gas,

four or five days were required for the color to develop in the broth medium used. Attention having been directed to the results obtained by Sullivan, Frankel & Vosges and later by Ayer in the color production by bacteria on synthetic media, studies in this direction were begun in 1908.

Numerous experiments were made with many forms of synthetic media containing various combinations of the substances recommended by those men, such as asparagin, ammonium lactate, magnesium, sodium phosphate, sodium chloride, etc.


78 N—1911 266, '11, 75,000 (P)

DEPARTMENT OF HEALTH

DISINFECTION TEST

To be called for by Driver

POISON! DO NOT DESTROY

Gift! Zerstöre es nicht

VELENO! Non Lo Distruggete

גיפט! צושטערט עם ניט

Test Issued .....

Date and Time Exposed .....

Name .....

Address .....

Disease .....

Disinfector .....

Laboratory Test .....

Result .....

Fig. 2.—Tissue Envelope containing Test Thread.

The formula given by Ayer and ascribed to Frankel & Vosges consists of:—

Asparagin	4 grammes.
Sodium Phosphate	2 grammes.
Ammonium Lactate	6 grammes.
Sodium Chloride	5 grammes.

Mix thoroughly and add 1000 c.c. of water.

After trying many modifications of this medium, it was found that it could be improved by the substitution of sodium lactate for ammonium lactate, as the former is more stable. It was also found that better results

were obtained after careful neutralization, a point not mentioned by Ayer. The following formula was finally adopted.

Asparagin	4 grammes.
Sodium Lactate	6 grammes.
Sodium Phosphate (Ortho)	2 grammes.
Sodium Chloride	5 grammes.
Water	1000 c.c.

The method of preparing this medium is as follows:—

The salts are finely powdered, and dissolved separately in 50 c.c. to 100 c.c. of water. When thoroughly dissolved, the solutions are added to the remainder of the water and the mixture if necessary is rendered alkaline to litmus by the addition of NaOH. It is then filtered and tubed into

DRIVER'S DAILY REPORT—DISINFECTION TESTS

Driver _____ Date _____

Name	Address	Test collected	No test left	Test lost

Form No. 26-w
Dept. of Health 413-11 (2) 10,000 N.Y.C., N.Y.

Fig. 3.—Driver's Daily Report Card.

$3x\frac{3}{8}''$ tubes. After sterilization on two consecutive days in the Arnold Sterilizer, the medium is tested for pigment production by inoculating one of the tubes with the Bacillus pyocyaneus.

If properly made the medium is a clear colorless fluid. When inoculated with B. pyocyaneus the color change presents itself in 24 hours time as a clear light green band in the upper portion of the test tube which stands out sharply from the colorless fluid below. This band gradually increases in depth until the entire content of the tube is a bright green. At the end of a week the color loses its clear green tint and becomes yellowish green and muddy. The medium thus gives a vivid color reaction. It was also found to have the added advantages of inhibiting the growth of non-chromogenic organisms.

System Adopted for Controlling Practical Disinfection. While these

studies were progressing the following system of testing municipal disinfection was formulated and adopted. The main points of this system are as follows:—

1. An oblong tissue paper envelope $3\frac{1}{2}$ x 4″ containing the test thread and stamped with all necessary indications for data. (See figure 2.)

2. A driver's report card, 3 x 5″ (fig. 3) which is enclosed in a stout manilla envelope and on which is recorded the receipt of the test. (See figure 4.)

3. A disinfector's card 4 x 6″, which when ready for final filling gives a simple complete history of the test from the date of its issue, through its final examination at the laboratory. (See figure 5.)

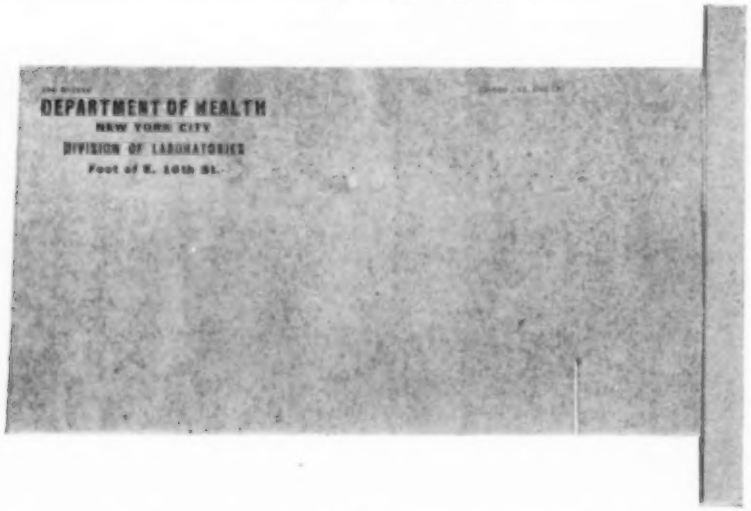


Fig. 4.—Manilla Envelopes in which Tests are returned to the Laboratory.

4. A bacteriologist's report (see figure 6) which gives in a concise manner a resumé of the work done by each disinfector during the entire week. These records are kept until the end of the week, and are then sent to the respective boroughs, where they are filed. The test envelope is filed with the case records. The disinfector's card is filed with his record and the Bacteriologist's report, in the Assistant Sanitary Superintendent's Office.

The technique in detail is as follows:—

Number 36 cotton is cut into inch lengths, placed in a Petri dish and covered with a forty-eight hour broth culture of B. pyocyaneus. They are left for two or three minutes or until they are thoroughly saturated, then removed to filter paper in another covered Petri dish and left to dry for 5 minutes, when dry they are placed in the tissue envelopes. (See figure 2.)

The envelope is dated and sealed and sent each day to the disinfector

who places it in the room which is to be disinfected, attaching it to the wall by means of its gummed flap.

After disinfection the driver who calls for the bedding, takes up the test, placing it in the manilla envelope (fig. 4) and entering it upon his card.

DEPARTMENT OF HEALTH

DIVISION OF LABORATORIES

Bacteriologist's Report on Disinfection Tests. Week Ending

Disinfector	Diphtheria	Scarlet Fever	Measles	Tuberculosis	Typhoid	Cerebro-Spinal Meningitis	Whooping Cough	Pneumonia (Bacillus)	Pneumonia (Streptococcus)	Old Tests Used	No. Tests Collected		

(Front)

BOROUGH REPORT

Borough	Number of Tests Sent	Number of Dead Tests Returned	Unused Tests Returned				
MANHATTAN							
BROOKLYN							
THE BRONX							
QUEENS							
RICHMOND							

(Back)

Fig. 5.—Bacteriologist's Report.

(See figure 3.) This envelope is then returned to the laboratory where the laboratory where the tests and receipt card are compared and any discrepancy noted. They are also compared with the daily list of disinfections done and checked back in the following manner:—

V—Test received.
X—Test not received.
(X)—Test received late. Noting delay in transmission.

The test envelopes are then stamped with date of receipt, and the threads are removed and placed in the synthetic medium. The tubes are incubated for 48 hours and the color reaction noted, and the results entered upon the test envelopes. Upon completion of this process the envelopes are sorted. They are then entered upon the disinfection cards. (See figure 5.) Account is also kept of the number of tests sent out and unused tests returned. At the end of the week, a Bacteriologist's report is compiled which

79 N—1912 12-677, '12, 2,500 (P)

DEPARTMENT OF HEALTH

Disinfector ..... REPORT ON DISINFECTION TESTS Week beginning .....

ADDRESS	Deaths	Test Issued	Test Exposed	Received at Desk	Tested	Disinfect. Success	Disinfect. Unsuccess	No Tests Collected	Old Tests Used	

Fig. 6.—Disinfector's Report.

shows at a glance the work of each disinfector, the number of cases of each disease for which disinfection was performed; the number of successful and unsuccessful disinfections; the number of tests lost, etc. (See figures 5 and 6.)

Resumé and Conclusions. In conclusion a recapitulation of the method of disinfection and its control, used in the New York Department of Health at present is as follows.

Disinfection of Rooms. This is done by means of the paraformaldehyde and potassium permanganate method. With this method we allow the following amount for 1000 cu. ft. of space, paraformaldehyde 30 grammes or 1 ounce, potassium permanganate 75 grammes or two and one half ounces, water 3 ounces.

The chemicals are put up separately in paste board boxes— the parafor-

maldehyde is placed in a round straw colored box, 1 3-8″ high and 2″ in diameter, the potassium permanganate is packed into a round black box 1 3-8″ high and 2 1-4″ in diameter. These boxes are then covered with melted paraffine. A small aluminium cup holding exactly 3 ounces of water is also provided together with a small pan, made of black iron. This pan is 4 1-4 inches wide at the bottom, two inches deep and 6 1-4 inches wide at top. (See illustration.)

When the premises to be disinfected are reached, the room is sealed, the disinfection test envelope is hung up at least 6 ft. above and 6 ft. distant from the disinfecting mixture. The contents of one straw colored box and one black box are mixed together in the pan and the 3 ounces of water are added; the mixture is again thoroughly stirred; the door of the room is sealed; and the room is left for 4 hours, when disinfection is said to be completed. The room is then opened and the test is removed and sent to the laboratory. If there is bedding to be removed this is sent to the disinfecting station to be disinfected with live steam.

The Disinfection of Books: the books are opened up so that the leaves are separated; they are then placed in a small steam chamber; and 6 ounces of paraform together with 24 ounces of water and 18 ounces of permanganate of potassium for 1000 cu. ft. is allowed. The heat is regulated so that it remains at a pretty even temperature of about 55°C. and the books are then left until disinfected.

The Control Test of disinfection is done by means of thread infected with a broth culture B. pyocyaneus which is placed in the tissue paper envelopes and then placed in the room or among the articles to be disinfected. Upon conclusion of the disinfection, the tests are collected by the drivers, collecting the bedding and delivered to the laboratory where the bacteriological test is carried out as previously outlined. Then the reports are forwarded to the various divisions.

All these methods have been in use for the past year and have proved satisfactory.

In closing I wish to thank most heartily Dr. William H. Park, General Director Division of Laboratories, for the many helpful suggestions and unvarying and kindly interest he has shown in these studies.

DETAILS OF A FEW OF THE TESTS CARRIED OUT IN THE INVESTIGATIONS

TEST 1

Technique in detail of room disinfection

Paraform	30 grammes	Size of room 1129 cu. ft.
Potassium Permanganate	70 grammes	Length of exposure 4 hours
Water	86 grammes	Bright sunshiny day

The floor made of concrete had just been washed.

Twenty-four hour bouillon cultures of B. coli and B. pyocyaneus were used on cotton threads. Threads were inoculated by immersion in these cultures and then dried on filter-paper. They were then placed in envelopes made of tissue paper, and suspended in the center of room at least 5 ft. distant from the pan. Ten threads of each were used and 5 controls of each organism were made and kept until the room was opened and the envelopes containing the test threads were removed. The test threads as well as the controls were at once placed in tubes of suitable media and the tubes incubated at a temperature of 37° for 3 days; after which readings were made.

TEST 1

Culture	Exp. Threads	Growth	No Growth
B. Coli	10	—	10
B. Pyo	10	—	10
Control on above			
B. Pyo	5	5	—
B. Coli	5	5	

Total number of tests exposed	20
" " " " showing growth	None
" " " " " no "	20:100%.

Under as near as possible identical conditions, this experiment was repeated on August 13th, 15th, and 18th. The humidity was not tested on the 13th, but was respectively 90 and 91 per cent on the last two days. The results were identical with those in the above table. All bacteria on exposed threads were destroyed.

More extended tests where bacteria were exposed in different portions of the room.

Paraform	29.23 gms.	Size of room 1129 cu. ft.
Permanganate	70 "	2 doors—1 window
Water	86 "	Length of exposure 4 hrs.
		Clear day
		Relative humidity 88%
		Entire weight of chemicals 186 gms.
		Weight of residue after test 104.68 gms.
		Weight of entire residue 104.68
		Amount lost in test 81.32 gms.

Loss in weight of residue 32.32 gms.
Amount of formaldehyde in residue .0304 per gm.
Entire amount of formaldehyde in residue 11.25%
Amount of formaldehyde given off 88.75%

In this test the threads were exposed on both cards according to the Wilson Method, and in envelopes according to the method given above. They were also placed in various parts of the room to ascertain distribution of the gas.

How Exposed	Where Exposed	B. pyo		B. coli	
		Growth	No Growth	Growth	No Growth
On cards Wilson Method	On floor 5 ft. distant	—	10	1	9
In envelopes	On floor 5 ft. distant	—	10		10
On cards	Upon top of closet 6 ft. above and	—	10	—	10
In envelopes	6 ft. distant	—	10	—	10
On cards	Upon wall 8 ft. above, 6 ft. distant from pan in left hand corner of room	—	10	[1]1	9
In envelopes	Upon wall 8 ft. above, 6 ft. distant from pan in left hand corner of room	—	10	—	10
On cards	On floor under table between	—	10	[1]1	9
In envelopes	closet and wall	—	10	3	7
Cards	On line center of room	—	10	1	9
Envelopes	On line center of room	—	10	—	10
Cards	On floor 6 ft, distant	—	10	—	10
Envelopes	On floor 6 ft distant	—	10	—	10

[1] Growth showed on 6th day after test tubes had been accidentally tipped.

Summary of total number of tests

How Exposed	Number	Growth	No Growth
On cards	120	4=3.3%	115=94.88%
In envelopes	120	3=2.4%	117=97.6%

1 tube lost.

TEST 6

In this test the penetrative power of the gas was tested and the amount of the chemicals was increased 1-10.

Paraform	33 gms.	Size of room 1129 cu. ft. 1 window, 2 doors
Potassium Permanganate	75 "	Length of exposure 4 hrs.
Water	90 "	Relative humidity 98%

Weight of entire residue 120.98 gms.
Loss in weight of entire residue.
Entire weight of chemical 198 gms.
Amount of formaldehyde given off in test 77.02%
Weight of residue after tests 120.98 gms.
Actual formaldehyde weight 29.70 gms.
43.58 gms.
Amount of formaldehyde in residue 3.48:11.71%
Amount of formaldehyde released 88.29%

How Exposed	Where Exposed	B. Coli		B. Pyoccyaneus.	
		Growth	No Growth	Growth	No Growth
On cards	On line in center of room 6 ft. above, 6 ft. distant from pan.		5		5
Envelopes	On line in center of room 6 ft. above, 6 ft. distant from pan.	—	5	—	5
On cards 1 in fold	On line in center of room 6 ft. above, 6 ft. distant from pan.	—	5	—	5
Blanket pocket in envelopes	On line in center of room 6 ft. above, 6 ft. distant from pan.	—	5	—	5

How Exposed	Where Exposed	B. Coli		B. Pyoccaneus.	
		Growth	No Growth	Growth	No Growth
On cards 2 fold in envelopes	On line in center of room 6 ft. above, 6 ft. distant from pan.	—	5	—	5
In envelopes 2 blanket pockets	On line in center of room 6 ft. above, 6 ft. distant from pan.	—	5	1	4
In envelopes	Near window, 8 ft. above, 5 ft. distant	—	5	—	5
On cards	Near window 8 ft. above, 5 ft. distant	—	5	—	5
In envelopes in 1 fold blanket pocket	Near window 8 ft. above, 5 ft. distant.	—	5	—	5
On cards in 1 fold blanket pocket	Near window 8 ft. above, 5 ft. distant.	1	4	—	5
In envelopes in 2 fold blanket pocket	Near window 8 ft. above, 5 ft. distant	—	5	—	5
	Near window 8 ft. above, 5 ft. distant	—	5	—	5
On cards in 2 fold blanket pocket	Near window 8 ft. above, 5 ft. distant.	—	5	—	5
On cards	In angle formed by closet and wall 5 ft. distant	—	5	—	5
In envelopes in 1 fold blanket pocket	In angle formed by closet and wall 5 ft. distant	—	5	—	5
On cards in 1 fold blanket pocket	In angle formed by closet and wall 5 ft. distant	1	4	—	5

How Exposed	Where Exposed	B. Coli		B. Proteyaneus.	
		Growth	No Growth	Growth	No Growth
On cards in 2 fold blanket pocket	In angle formed by closet and wall 5 ft. distant	3	2	—	5
In envelopes	On floor in angle formed by closet and wall, 7 ft. distant	—	5	—	5
On cards	On floor in angle formed by closet and wall, 7 ft distant	—	5	—	5
In envelopes 1 fold blanket	On floor in angle formed by closet and wall, 7 ft. distant	—	5	—	5
On cards 1 fold blanket	On floor in angle formed by closet and wall, 7 ft. distant.	—	5	—	5
In envelopes in 2 fold blanket	On floor in angle formed by closet and wall, 7 ft. distant	—	5	—	5
On cards 2 fold blankets	On floor in angle formed by closet and wall, 7 ft. distant	—	5	—	5
Cards	Floor near window	—	5	—	5
Envelopes	Floor near window	—	5	—	5
On cards 1 fold blanket pocket	Floor near window	—	5	—	5
In envelopes 1 fold pocket	Floor near window	—	5	—	5
On cards 2 fold blanket pocket	Floor near window	—	5	—	5
In envelopes 2 fold blanket pocket	Floor near window	—	5	—	5

Summary of tests

How Exposed	Number	Growth %	No Growth %	Growth %	No Growth %
On uncovered cards	50	1	49	2	98
On cards under 1 fold blanket	50	1	49	2	98
On cards under 2 fold blanket	50	4	46	8	92
In envelopes	50	—	50	—	100
In envelopes under 1 fold blanket	50	—	50	—	100
In envelopes under 2 fold blankets	50	2	48	4	96

BOOK DISINFECTION

Formaldehyde Alum. Sulph. Lime method and heat—3 hrs. exposure
Amt. of Formaldehyde estimated 40% per 1000 cu. ft. 35 oz.
Size of room—176 cu. ft.
Temperature ranged from 49° to 50° C. for 1 hour and from 50° 51° C. for 2 hrs.
One-half of the tests were incubated at once, the remaining half were kept 24 hrs. to determine death or attenuation of the testing organisms.
Book used.—Vol.—1 560 Page–Board and Linen covers Book open Covers Held Back.
2 193 " " " " " " " " " "
3 575 " " " " " " " " " "

TABLE FOR TEST

Incubated at once

Book Pages	Cond.	Bact.	Growth		No Growth		Doubtful	Total
			Thread	Paper	Thread	Paper		
Vol. 1–560	Open	B. Pyo	2	4	15	13	—	34
	"	B. Coli	6	—	12	18	—	36
2–195	"	B. Pyo	3	2	7	8	—	20
		B. Coli	6	1	4	9	—	20
3–575	Closed	B. Pyo	—	2	8	6	—	16
		B. Coli	—	4	8	4	—	16

Summary

Total number of tests made and incubated at once 142
" " " " " " kept 24 hrs. before incubation 119
Of these incubated at once growth showed in 30:21%
" " " "no " present 112:79%
" " " kept 24 hours before incubation growth showed in 27:22.6%
" " " " " " " " "no " " in 92:77%

Total number of tests made—261
" " " " showing growth 57:21%
" " " " no growth 204:79%

Formaldehyde Alum. Sulph. and Lime method
Amount of formalin (estimated 40%) 44 oz. per 1000 cu. ft.
Range of temperature 49° C. 1-2 hour 55° C. for 2 1-2 hours
Size of room (Steam sterilizer) 276 cu. ft. 3 hrs. exposure
1-2 tests incubated at once, 1-2 kept 24 hrs. before incubation
Books used.
Vol. 1–575 Pages Board and Linen Covers. Covers snapped back open
2–288 " " " " " " " " "
3–575 " " " " " Book closed
4–210 " " " " " " "

Incubated at once

Books	Pages	Cond.	Bact.	Growth		No Growth		Total
				Thread	Paper	Thread	Paper	
Vol. 1	575	Open	B. Pyo	—	—	10	10	20
			B. Coli	—	—	10	10	20
2	288	"	B. Pyo	—	—	8	8	16
			B. Coli	—	—	8	8	16
3	575	Closed	B. Pyo	—	—	10	10	20
			B. Coli	—	—	10	10	20
4	210	"	B. Pyo	—	—	10	10	20
			B. Coli	—	—	10	10	20
				—	—	76	76	152

Summary

Number of tests made and incubated at once showing growth 1:0.4%
" " " " " " " " not " " 152:99.6%
" " " " " " " " after 24 hrs., not showing growth 132:100%
Total number of tests made not showing growth 284
" " " " " showing growth 1:3%
" " " " " not" " 283:99.7%

Formaldehyde and Lime and Alum. Sulph. Method
Exposure made at room temperature 24 hrs.—Day clear and dry
Amt. of formalin—estimated 40% 18-6 oz. per 1000 cu. ft.
1-2 tests incubated at once 1-2 kept 24 hrs.
Books used. Vol. 1–290 Pages open
2–358 " "
3–352 " closed
4–240 " "

Incubated at once

Books	Page	Cond.	Bact.	Growth		No growth		Total
				Thread	Paper	Thread	Paper	
1	290	Closed	B. Pyo	9	6	3	7	25
2	358	"	B. Coli	7	7	—	7	21
			B. Pyo	11	8	1	4	24
			B. Coli	12	9	1	3	25
3	352	Open	B. Pyo	6	3	4	7	20
			B. Coli	8	2	2	7	19
4	240	"	B. Pyo	6	3	4	7	20
			B. Coli	8	2	2	7	19
				67	40	17	49	173

Summary

Number of tests made and incubated at once showing growth 107:61.84%
" " " " " " " " " no " 66:38.9 %
" " " " " kept 24 hrs. before incubation
" " " " showing growth 66:46.52%
" " " " " no " 53:54.8 %
Total number of tests made showing growth 174:54.8 %
" " " " " " no " 142:44.1 %
Total number of tests made 317:100

Experiment with dry heat

In this experiment heat alone was used, the books being placed in a steam sterilizer and subjected to dry heat

The length of exposure was 3 hrs.

The temperature varied from 48° to 55° C.

Books used Vol. 1 Pages — Books opened covers held back
2 " — " " " " "
2 " — " closed board and linen covers

Incubated at once

Books	Pages	Cond.	Bact.	Growth		No growth		Total
				Thread	Paper	Thread	Paper	
1		Open	B. Pyo	11	14	4	2	31
		"	B. Coli	14	16	1	0	31
2		Closed	B. Pyo	2	6	6	2	16
		"	B. Coli	5	7	3	1	16
3		"	B. Pyo	3	8	6	1	18
			B. Coli	4	6	5	3	18
				39	57	25	9	130

Summary

Number of tests incubated at once showing growth 96:75.87%
" " " " " " " no growth 34:26.5 %
" " " kept 24 hrs. before incubation showing growth 46:61.97%
" " " showing no growth 37:20%
Total number of tests made showing growth 169:68%
" " " " " " no " 79:31%
Entire number of tests made 248:100%

This experiment was repeated with similar results.

In this test the books were exposed to heat alone, the exposure being made in steam sterilizer, and the books subjected to dry heat. Length of time of exposure was 23 hours.

Temperature ranged from 50°–55° C. 1-2 tests incubated at once
1-2 tests kept 24 hrs. to determine attenuation

Books used
Vol. 1 Pages
1 Open covers held back
2 575
3 575 Board and linen covers closed
4 356 " " " " "

This resulted in death of testing organism but the books were warped and showed the result of long continued heating.

Books	Pages	Cond.	Bact.	Growth		No growth		Total
				Thread	Paper	Thread	Paper	
Vol. 1	210	Opened	B. Pyo	—	—	8	8	16
			B. Coli	—	—	8	8	16
2	575	"	B. Pyo	—	—	8	8	16
			B. Coli	—	—	8	8	16
3	575	Closed	B. Pyo	—	—	10	10	20
			B. Coli	—	—	10	10	20
4	"	"	B. Pyo	—	—	12	14	26
			B. Coli	—	—	13	13	26
				—	—	77	79	156

In this test a new book was used to ascertain the action of heat upon the paper and binding. It was exposed for a period of about 2 1-2 hours at a temperature of 55°C. and beyond a slight spreading of the leaves showed no damage.

A TITANIC PARALLEL

HUGH ARBUTHNOT BROWN, M. D.

Washington, D. C.

Before the horror of the *Titanic* disaster has been entirely forgotten, it may not be amiss to call attention to the vast number of preventable deaths which take place about us every day—deaths to a large extent no less due to lack of preparedness on our part than were the deaths of those unfortunates who went down with the *Titanic* due to lack of preparedness on the part of the steamship company. In each case, however, in the last analysis the fault lies with the countries whose inadequate or poorly enforced laws permit such a wholesale slaughter of innocent victims.

In the case of the *Titanic*, life boats were available for only about a third of the complement of officers, crew, and passengers, and as a consequence the remainder were left to drown or succumb to the icy cold of the North Atlantic. The lack of "life boats" in the way of proper facilities for the preservation of health and the prevention of disease is the cause of the majority of the thousands of deaths occurring every year from such diseases as tuberculosis, typhoid fever, diphtheria, and diarrhoea and enteritis among infants—to mention specifically only four of the most prominent diseases of a largely preventable nature.

As with the *Titanic* the iceberg was the actual, although unseen, cause of the disaster which snuffed out the lives of approximately fifteen hundred men, women and children, so the tubercle bacillus in tuberculosis, the Klebs-Loeffler bacillus in diphtheria, the bacillus typhosus in typhoid fever, and the various pathogenic micro-organisms in diarrhoea and enteritis are the agencies, invisible to the naked eye, but none the less deadly, which year after year continue unnecessarily to take their toll of lives.

The *Titanic* followed the extremely dangerous northern route at a season of the year when icebergs might reasonably be expected to be encountered, and even after these menaces to safe navigation had been reported in the steamship lanes. Similarly, many of us daily take needless risks in countless ways bearing more or less directly on the question of our personal health, as, for example, by the use of polluted water, of common drinking utensils, of unripe or contaminated fruit and vegetables, or by heedless exposure to contagious diseases.

On the other hand, as the utilization of one of the latest marvels of electrical science was undoubtedly the direct cause of saving from the sea most, if not all, of those who were rescued from the *Titanic*, so we have at our command the latest serums, bacterins, and antitoxins, together with other

advanced methods of prophylaxis and cure, to meet the hordes of disease-producing organisms and prevent their abnormal development in the body.

The shock of a *Titanic* disaster resounds the world around; for weeks our newspapers were filled with accounts of the terrible and wholly unnecessary loss of life. The lurid headlines are read and discussed in the homes of the wealthy, in the crowded tenements of the poor, in hundreds of dust-laden factories and mines, and in the quiet of the secluded farm. Yet how many of all these thousands, who had no direct connection with the tragedy except the common bonds of horror at the needless sacrifice and sympathy with the bereaved, stopped for a moment to think of the ruthless slaughter taking place about them every day?

In 1910, the latest year for which official figures are available, and confined to what is known as the "registration area," comprising 58.2 per cent. of the population of continental United States, there were no less than 86,309 deaths from tuberculosis, or an average of over 235 a day. In the entire United States it is safe to say that there were fully 150,000 deaths during 1910 from this disease alone, or over 410 every day in the year. In other words, every four days more persons died in the United States from tuberculosis than were lost when the *Titanic* received her death blow.

During the same year and in the same limited area 54,266 children under two years of age died from diarrhoea and enteritis. Here again, in the United States as a whole, fully 95,000 children succumbed to this disease of hot weather, poor food, and crowded and insanitary surroundings—the death toll of the *Titanic* repeated every six days. Approximately 25,000 deaths occurred as a result of typhoid fever and another 20,000 from diphtheria. Here then is combined a loss of 290,000 lives during one year alone, or at the rate of nearly 800 every day, from only four of the largely preventable diseases. One hundred and ninety *Titanic* disasters would barely equal this annual sacrifice.

Now let us look at the matter from a purely mercenary standpoint. Professor Irving Fisher, of Yale University, estimates that in the case of tuberculosis alone "the gross loss of earnings by illness and of potential earnings cut off by death, together with the expenses of illness, etc., amount to over $1,000,000,000 per annum," the loss to consumptives themselves amounting to over $660,000,000, and to the community to $440,000,000. Professor Fisher believes that "at least three-fourths of these costs are preventable." The annual cost of typhoid fever in the United States has been estimated by Dr. George M. Kober at $350,000,000, and that of malaria, by Dr. L. O. Howard, of the Department of Agriculture, at $100,000,000.

Professor Fisher further asserts that "the actual saving annually possible in this country by preventing needless deaths, needless illness (serious

and minor), and needless fatigue, is certainly far greater than one and a half billions, and may be three or more times as great."

Notwithstanding the present great loss of life and of earnings from tuberculosis, typhoid fever, diphtheria, and diarrhoea and enteritis alone, the problems of saving and prolonging life through prophylactic measures are being attacked with greater and greater vigor every year, with resulting decrease in the death rates of practically all preventable diseases. Thus, in the case of tuberculosis, the annual average death rate from 1901 to 1905 was 193.2 per 100,000 population in the registration area. In 1910 the rate had decreased to 160.3. In other words, if the average rate for the five-year period 1901–1905 had obtained in 1910, there would have been 104,026 deaths from tuberculosis in this area instead of the 86,309 which actually were reported, a saving of the lives of 17,717 persons from this one disease. Similar results have been attained in practically all diseases of a more or less preventable nature, decreases in the death rates during the past ten years appearing in substantially all cases, due to a large extent, if not wholly, to advanced methods of dealing with our great health problems.

Much of course still remains to be done in the matter of health education on the part of the public, as well as in increased effort by national, state, and municipal health officers and physicians to efficiently enforce existing health laws and regulations and to secure additional and more comprehensive legislation where needed. Although the millennium is not yet at hand, when all diseases of a preventable nature will actually be prevented and man will succumb only to accident or old age, certainly during the last fifty years there has been an improvement in the health of the nation decided enough to warrant the hope and belief that, with improved facilities for preserving health and warding off disease, and increased knowledge of the science of health preservation on the part of the public at large, an approximation at least of this Utopian condition may ultimately be attained.

A DEVICE FOR KEEPING GARBAGE CANS IN PLACE

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Some time Health Officer, Colon and Cristobal

Read before the Municipal Health Officers' Section, American Public Health Association, Havana, Cuba, December, 1911

In the early days of sanitation at Colon and Cristobal, it was somewhat of a problem to keep garbage in the cans provided by the Sanitary Department for the purpose; principally, I suspect, because the inhabitants of Colon and Cristobal had always been in the habit of throwing their garbage broadcast, and the standard garbage cans furnished by the Sanitary Department were somewhat of a novelty and treated as such for a long time.

After we finally succeeded in getting the inhabitants to put at least some of the garbage into the cans, it was another problem to have the covers placed on the cans until the time of collection, which were made twice daily. The garbage cans from the beginning were the favorite haunts of horses, dogs, etc., for subsistence, and in their efforts to get at the contents of the cans, they invariably knocked them over, and those that were not knocked over by the animals were turned over in sport by children and loafers.

The Department of Sanitation furnished from the beginning the standard galvanized iron garbage cans of the following dimensions: 19″ x 36″: with covers;—these covers might just as well have never been sent us for use in Colon and Cristobal for all the good they did in keeping the cans covered. At Cristobal are located the laborers' camps accommodating about 1500 West Indian laborers. This camp was for single men, but they were allowed to do their own cooking; and it was necessary to supply a sufficient number of garbage cans to meet the requirements of each building that went to make up the camp. The policy of the Department was to place the cans where they would be of the greatest use to the greatest number and, at the same time, be convenient for access of collection. This location at Camp Bierd was at the foot of the steps leading up to each house.

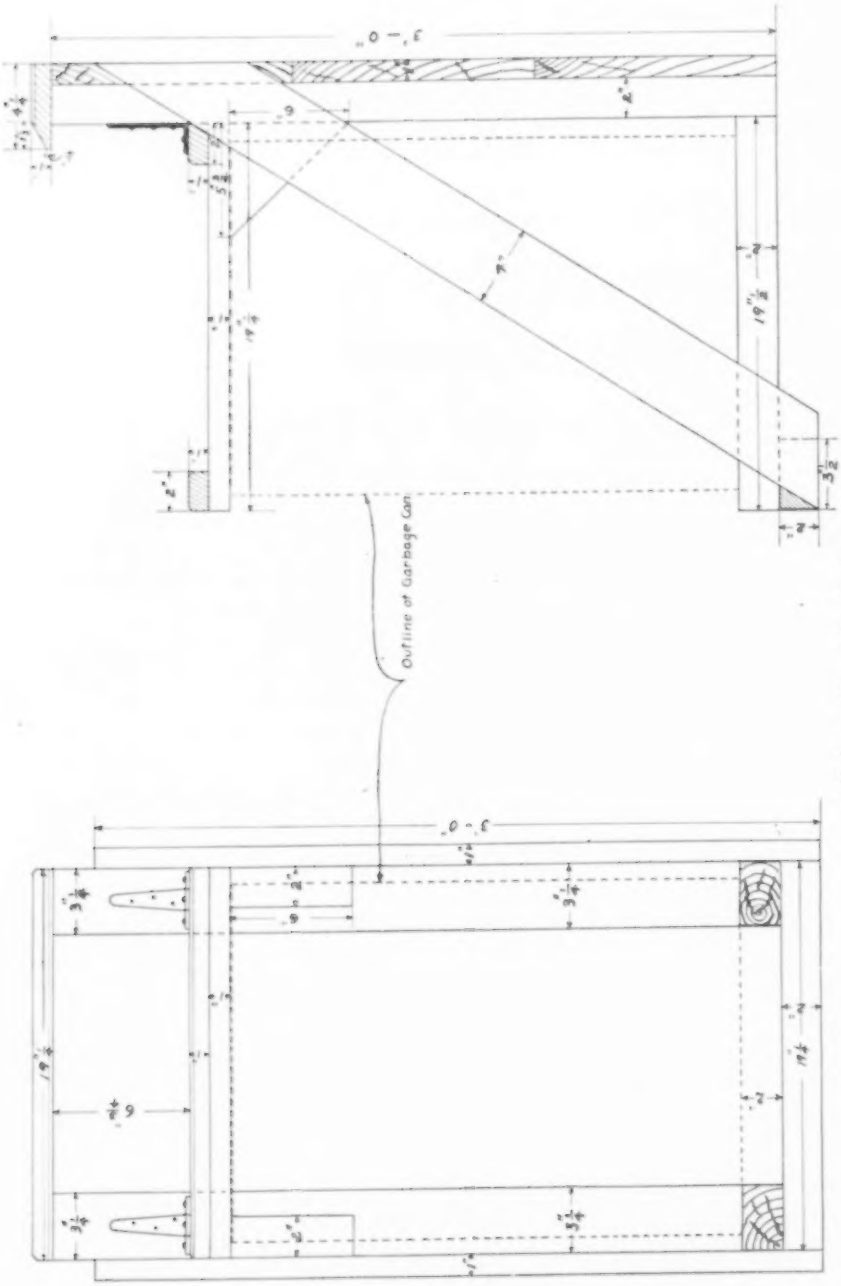
Frequently the garbage collector would find the garbage strewn all over the surface of the ground and the can kicked under the building or into some out-of-the-way place where it was of no service whatever as a garbage receptacle. Wet garbage strewn over the surface is a magnet for flies and vermin of all kinds and especially on the Isthmus where the rain-

fall is heavy. Grease and other liquid garbage naturally saturated until it reached the level and finally piled up on the surface of the ground, so that there would be a solid mass of three or four, possibly five inches of ideal fly material, in which—after a few hours—maggots could be found in large numbers. To avoid this and to assist in keeping the camp clean, it was absolutely necessary that some device be made for keeping the garbage in the cans and the cans in place, and to this end the "self-closing garbage can stand," as shown in the accompanying photograph, was gotten up and put into use in the laborers' camp. The object of the stand was to make the garbage cans fly- and rat-proof and to furnish a self-closing cover. A stand made according to the accompanying blueprint will accomplish this in a satisfactory manner and is proof not only against flies and rats, but will prevent horses, dogs, cats, and other animals from gaining access to the contents of the can. When the stands had been in service in the laborers' camp for a period of eighteen months and had given entire satisfaction during this period, in addition to improving the appearance of the camp considerably and causing the garbage can to remain in one place at all times, it was noticed that the laborers did not bother the cans, for when placed in the self-closing stand and located at a point convenient of access to the occupants of the barracks, as well as the collector, the laborers rather liked the idea of raising the cover and throwing garbage into the can just to see the cover fall back in place without any effort on their part.

As stated above, after the stands had been in use in the camps for some time, it was thought advisable to extend their use to the city of Colon where similar conditions prevailed. The same class of people, West Indians, lived in both places, and consequently our troubles with these cans in the laborers' camps was repeated in Colon. The stands were installed on every house in the city of Colon at the expense of the house owner, and later it was made obligatory for every house owner to furnish a sufficient number of garbage cans and self-closing stands to meet the requirements of the occupants of his house, this number being determined by the Sanitary Department after observation for a sufficient period of time to gage the amount of garbage produced by the occupants of the building. These stands have now been in use in Colon and Cristobal for nearly three years and, during all that time, have given satisfaction in every respect and have solved the problem of keeping garbage cans in place.

Conclusions.

First;—This self-closing garbage can stand furnishes a cover that cannot be taken off easily and thrown away, as can be done with the cover furnished with the standard garbage can.



Self-closing Stand for Garbage Can.

Second;—When made to fit the can, it provides a perfectly fitting cover which does not admit of the entrances of flies, rats, etc., to the contents of the can.

Third;—The stand can be placed up off of the ground, as shown in the accompanying illustration, at some point convenient of access to the occupants of a house and the collector, and is thereby out of reach of children and others who have a habit of knocking over garbage cans when they are placed in alleys or on sidewalks or in patios.

Self-closing Garbage Stand.

Fourth;—With the self-closing stands, the garbage can is placed out of reach of dogs and horses which in this country have to be reckoned with, as these animals depend to a great extent for their subsistence on refuse wherever found.

Fifth;—The cost of making the stand is reasonable;—the Health Office at Colon and Cristobal furnished all of them used in Colon and Cristobal, some 2,000 in number, at a cost of $1.29 U. S. C. per stand. This figure includes the making of the stand and its installation on the building.

TUBERCULOSIS AND QUARANTINE

DR. ALFREDO G. DOMINGUEZ

Third Health Officer of Port of Havana, Cuba

Read before the American Public Health Association, Havana, Cuba, December, 1917

The attention of all the governments is today fixed on the tuberculosis campaign, and their efforts are directed against this disease, which is no doubt one of the greatest calamities suffered by mankind. Notwithstanding this fact, nothing has been done against the travelling tuberculous person who carries the infection all over, spreading the germ on board ship and among his fellow passengers, who are in most cases, ignorant of the great risk they are running.

Dr. A. H. Doty, Chief of the Quarantine Service of the Port of New York, and an authority in that matter, has just published a book entitled "Infectious Diseases and their Prevention," and in order to classify the quarantinable diseases, he divides them into three groups or classes. In the first he includes: cholera, smallpox, plague, yellow fever, and typhus fever, known throughout the world as quarantinable diseases. In the second he groups, diphtheria, scarlatina, measles and varicella; and in the third the other infectious diseases such as typhoid fever, tuberculosis, etc. Referring to the latter group he states "although the latter group are not as readily transmitted from one person to another as are diseases of the first and second classes nor subjected to such definite quarantine regulations, it is necessary that some means be taken to prevent their extension."

All over the world but in our country especially, the tuberculous have no other means of leaving the territory, than by ships, and we the Quarantine Doctors are well aware of the great number of afflicted Cubans and foreigners, that continuously and especially during the summer months, leave the country in search of pure mountain air in order to obtain a cure or relief. A tuberculous patient except in the most advanced state, can always easily sail without any restrictions especially if going as a first-class passenger. Once on board he mingles with the rest of the passengers as if he were a healthy individual, takes his meals at the same table, drinks out of the same glasses used by the public, and his berth and stateroom is again used by somebody else, there being no law that compels the ship to fumigate and paint it.

With reference to the 3d class passenger I can state that many Spaniards and Cubans suffering with the disease, sail in summer, generally during the months in which the steamers are most crowded, under the worst of hygienical conditions, spitting on the floors, and spreading the infection in various ways to their fellow passengers.

We take great care and pay a great deal of attention to the isolation of the patients suffering from other quarantinable diseases, and nevertheless allow the tuberculous to mingle freely with their fellow passengers and under the most favorable conditions to spread the disease. Just think of what 3d class accommodation means; without an opportunity of having the sun rays enter to exercise their germicidal action, without any ventilation, and with a great congestion of people under the worst possible conditions.

This state of affairs is very serious and it is absolutely necessary that something be done to terminate it, and protect the travelling public.

When a case of smallpox, plague, cholera or typhus appears on board, the patient is isolated, the place occupied by him fumigated, and the persons most in contact with him are subject to strict observation. If it happens to be smallpox, we vaccinate or re-vaccinate all the passengers, and those considered not immune are kept in quarantine for 14 days. Nevertheless well known tuberculous patients travel freely, eat at our sides spreading the germ through their saliva on our foods, infect the glasses from which other persons and children drink and may even kiss children unlucky enough to be their fellow passengers, and offer fruits and candies infected by the touch of their infected hands.

It is about time that this state of affairs be stopped by means of proper legislation. I do not suggest that the tuberculous be prevented from travelling but that the Congress take the necessary steps to regulate them during travel. Every tuberculous person known as such, if he be a 3d class passenger should be compelled to travel in the ship's hospital or in a special part isolated from the rest of the passengers. If he be a first class passenger he should be obliged to take an entire stateroom and take his meals in it. If the passenger cannot afford an entire 1st class stateroom he should travel in the hospital of the ship. The captain and surgeon of the ships should be compelled to report the case or cases of tuberculosis on board to the Quarantine officers at the port of destination. These officers should order the disinfection of the hospital, stateroom or other place occupied by the sick passenger, and require the painting of the same if considered necessary.

The above measures could easily be carried out and thereby the possibility of secondary infection avoided. It would be interesting to know how many cases of tuberculosis are caused by infection on ship board, either by contact or room infection.

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THE WEAK SPOT IN THE SANITARY CHAIN

Every now and then it is borne in upon the sanitarian that in spite of the wonderful additions to sanitary science since 1880, and in spite of improved organization of boards of health, better inspection service, better laboratory facilities, more highly trained medical men and a sympathetic and intelligent appreciation of his work on the part of the public, somehow or other the sanitarian's millennium seems almost as far off as ever.

A recent British Government publication, entitled "Extracts from Local Government Board Reports upon Sanitary Administration in Certain Urban and Rural Districts" brings these facts forcibly to mind as being true even in the country which was the first to begin sanitary reforms and has always been one of the most enthusiastic in supporting and advancing them. The document begins with an introductory note stating that the "Extracts" in question were taken from the Annual Reports of the Board and published in response to a request made to the Chancellor of the Exchequer in the House of Commons November 9, 1911, during a discussion of the National Insurance Bill dealing with "Excessive Sickness." In referring to these reports the Chancellor of the Exchequer stated:—

"What are the main complaints of these (Friendly) societies with regard to these extra causes of ill-health which add to their pecuniary benefit? Bad drainage, bad water supply, bad housing, factories and workshops not in accordance with the condition of the law, and the offenders are local authorities and private individuals. We have had years of Public Health Acts in this country; we have had Local Government Inquiries without number; we have had recommendations of Medical Officers of Health, and of Inspectors of the Local Government Board. I shall be able to prove that they are absolutely helpless in hundreds of cases, and have been for years, not because the Local Government Board has neglected its duty. On the contrary, any one who peruses their reports will see how very concerned they have been about this for years. It is purely because they are armed with the clumsiest, trustiest weapon in the whole army of British law—the mandamus, a perfectly worthless weapon." (Parliamentary Debates, House of Commons, Thursday, 9th November 1911, Vol. 30, No. 143.)

Next follow certain abstracts of inspector's reports each dealing with the "ground of inquiry" and the "chief facts reported by the inspector."

Even brief perusal of these abstracts is sufficient to show that all over Great Britain, nearly a century after Chadwick and Simon and Farr and Kingsley and others did their work, there still remain innumerable examples of bad housing, bad water supplies, bad sewerage, bad milk supplies, bad scavenging, a deficiency of hospital disinfection,—in short, thoroughly insanitary conditions generally.

The fact is that in sanitation, as Dr. J. S. Billings long since remarked "we know far better than we do." But what are we going to do about it? Clearly if we would avoid disappointment we must first follow Matthew Arnold's admonition and avoid "nursing any extravagant hope." We must in the next place paraphrase again the words of the same scientific poet of the Nineteenth Century and try to "see our problem and see it whole,"—that is to say, to see its difficulties and drawbacks, as well as its benefits and successes. Above all, we must learn to be patient, not expecting to make the world over in a day or a decade but determining nevertheless to keep everlastingly at our work, believing that in the long run we shall do away with most of the remediable ills which now afflict mankind, and that we shall meanwhile make life cleaner, sweeter, happier, and very likely longer.

The Chancellor of the Exchequer appears to think that better legislation would enable the sanitary authorities to effect all necessary reforms. This is undue optimism. In America at least, the people are usually better led than driven, and it is more than doutbful whether better laws would meet the situation even in England. Education, like law, can do much, but time and patience must be mingled with law and education, probably for a long time to come, before ideal relations will be reached, or even approximated.

ALL ABOARD FOR WASHINGTON

The Secretary of the American Public Health Association states that the outlook for the annual meeting is very bright. A large number of members have already announced their intention of being present and a strong program has been arranged. With the XV International Congress occurring the week following the meetings of the A. P. H. A., the opportunity is such an extraordinary one that it is confidently expected that the attendance records of the past are going to be smashed. The Association will make a fine showing before the public health workers of the world.

PASTEURIZATION OF MILK WITH SUGGESTIONS AS TO METHODS AND APPARATUS TO BE EMPLOYED

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This article is not for the purpose of entering into any extended or elaborate scientific description of the value, or otherwise, of the pasteurization of milk; nor is it intended to recommend any specific equipment or apparatus to be employed in its pasteurization. It is prompted by a desire to indicate, in a general way, the reasons why the Department of Health favors the pasteurization of milk; to state the results which it is desired shall be obtained; and to show the advantages and disadvantages of the different methods and apparatus which are employed, as has been shown by the experience of inspectors in observing and testing the apparatus while in actual use.

Inquiry is frequently made by milk dealers as to "what the Department wants" in the pasteurization of milk, and in the absence of any tabulated information on the subject, or any available book, which deals in a practical way with the subject, the dealers are much at sea; and frequently each one is obliged to work out the problem himself, and arrives at his conclusion by what are sometimes costly experiments. This article is an attempt to help the milkman solve his problem.

The application of heat in order to preserve food stuffs has been employed for an unknown length of time.

About 1782, a Swedish Chemist, Scheele, discovered that vinegar could be preserved against spoiling by heating it; and not long after this others began to preserve fruits, vegetables, milk, etc., by heating them in enclosed vessels. Not until 1870, however, did Louis Pasteur, in his studies of the causes of deterioration which took place in wines and beers, discover that the heating of these products destroyed certain forms of life which gave to the liquors bad flavors, etc. which he termed "diseases." He found that by heating to a temperature of 158 to 176 degrees F. and holding the fluids at this temperature for a period of time these "disease germs" as he called them, were destroyed, and the quality of the wines and beers improved. In consequence of this valuable discovery, the heating of wines and beers became very generally practiced in Europe and the process was termed "pasteurization" from the name of the man who originated it.

In Denmark, the process of heating was applied to milk, for the purpose

of destroying germs, especially in order to improve the flavor and quality of the butter produced in that country; and later, also in order to assist in the elimination of tuberculosis among cattle, it being required that all skim milk from butter factories be pasteurized before being fed to calves, swine, etc.

In this country, the destruction of bacteria by boiling milk to be used for infant feeding was strongly recommended in the 70's by Dr. Jacobi, an expert on infant feeding. The heating of milk which was to be used in its fluid state for market purposes, was at first employed by milk dealers for the purpose of preventing or delaying the souring in milk due to the fermentation produced by the enormous number of germs in milk which had previously been so badly handled or so insufficiently refrigerated, that it would otherwise be unmarketable, and thus become a loss to the dealer. In consequence of the faulty methods employed and the purpose of the dealers, Health authorities at first looked upon the pasteurization of milk with disfavor, because it was considered to be a make-shift and a means of covering up bad practices in its production and handling. Fuller consideration on the subject of milk control, however, made it evident that it was practically impossible to procure for the entire milk supply of large cities a safe, raw product. This fact at length induced food experts to favor the pasteurization of milk as a safeguard against dangerous infection. This idea has been largely strengthened by recently discovered knowledge that milk may become infected by germs of certain diseases without those persons responsible for the production and handling of milk knowing that such infection was taking place. It has been discovered that persons may be, and often are infected with the typhoid bacilli, and that they are what are known as "typhoid carriers," without themselves knowing that they are thus infected. In certain instances also, persons who do not know that they are infected with diphtheria or other communicable diseases may handle the milk and thus infect it. A recent fatal epidemic of septic sore throat which occurred in Boston, and in which over 2000 persons were made sick, was traced to infected milk. In addition to these facts it has been demonstrated that a considerable number of children die from tuberculosis which is of bovine origin, and it is also certain that many who recover from diseased glands of the neck have tuberculosis of this type. It is now certain that this infection enters the body through the milk used as food. This makes it important that the milk which is used by children shall be free from tubercular infection.

It has been demonstrated that when milk has been heated to a temperature of 140 degrees and held thereat for twenty minutes, all of the disease producing bacteria are killed; also, that if milk is heated to a uniform temperature of 158 degrees for one minute, all such disease germs are killed. In view of the fact, however, that in most commercial processes

of pasteurization the temperature is likely to, and does fluctuate, it is necessary to insure that all parts of milk will get the full temperature required. This is accomplished by holding the hot milk for a known length of time in order to equalize the temperature. The period of time for holding milk at a temperature of 158 degrees has been officially fixed by the New York Board of Health as three minutes, or at 140 degrees for twenty minutes. Between these extremes of temperature, varying degrees of heat with corresponding varying lengths of time for holding at these temperatures have been decided upon by the Board of Health as follows:

No less than 158 degrees F. for at least 3 minutes.
No less than 155 degrees F. for at least 5 minutes.
No less than 152 degrees F. for at least 10 minutes.
No less than 148 degrees F. for at least 15 minutes.
No less than 145 degrees F. for at least 18 minutes.
No less than 140 degrees F. for at least 20 minutes.

It has been found that milk which has been heated to an excessive degree, say 160 degrees or over, has some of its constitutent parts changed, and is somewhat injured as an infant food. As the temperature rises above 160 degrees these changes begin to occur and take place to an increasing extent as the heat reaches the boiling point. The milk sugar becomes somewhat scorched; the casein and albumin are hardened; the calcium, magnesium and phosphoric salts are partially precipitated; and the digestibility of the milk is impaired. There is also this commercial objection, viz: that in milk which is heated and held at high temperature, the cream will not rise as well as if it is unheated, and what is known as the "cream line" is interfered with. As heating at lower temperatures for the required time has all the advantages and none of the disadvantages of heating at higher temperatures it is to be preferred.

Milk which contains an excessive number of bacteria contains as a product of their growth a quantity of acids and other undesirable substances, and may contain also dangerous poisons. These are only partially destroyed by even a boiling temperature and it is thus desirable that the milk which is to be pasteurized shall, before heating, be as free as possible from bacteria.

The pasteurized milk which New York health authorities consider to be the safest and which they desire shall be produced for use in New York City is milk which in its unheated state, did not contain an excessive number of bacteria, and which when heated is subjected to a temperature which destroys all disease producing bacteria and a large percentage of bacteria of all kinds; also, that all such milk have its constituent parts as little altered by excessive heating as possible.

In order that Health authorities may be assured that these desired results are obtained in milk which has been commercially treated, two general methods of control are open. One method is to judge of the effectiveness of the apparatus used by means of the chemical and bacteriological conditions which are found to exist in the pasteurized milk which is under examination; the other method of control is to make sure by inspection and tests that the apparatus and equipment in use are proper and efficient and are working as nearly automatically as possible. If these conditions are satisfactory authorities can rest assured that if the apparatus is properly used the results obtained will, of necessity, be satisfactory, and that the finished product will respond to whatever bacteriological or chemical tests may be applied.

The New York Department of Health considers that the latter method of control is the most feasible and effective with the limited inspectorial and laboratory forces at its disposal, and for this reason insists that the apparatus and equipment used in pasteurization shall be tested and approved, and that automatically made heating records shall be kept on file by the concern pasteurizing the milk, before permits for pasteurization shall be granted. Occasionally bacteriological tests are made in order to indicate if the equipment is being properly used and operated.

Without recommending any particular makes of apparatus which will do good work, it may be said that an ideal system of pasteurization would be as follows:

First: The various stages in the treatment of the milk should be carried on in separate, clean, well-lighted and ventilated rooms or compartments.

Second: There should be as little piping as possible and the use of pumps should be avoided after the heated milk has entered the holder; also the arrangement of the apparatus should be such that the milk will flow by gravity from point to point in the process of treatment.

Third: In order to prevent superheating the milk the heating should be effected by the milk flowing over a water-heated surface which is relatively large for the amount of milk heated, and which is automatically kept at a temperature not over 15 degrees higher than that at which it is desired to heat the milk. This heating surface should be heated by contact with hot water; no live steam should strike this heating surface. The water should be heated in a tank outside of and separated from the pasteurizer and kept by means of a thermostat at a uniform temperature, and then injected into the pasteurizing machine. The speed of flow of the milk through the heating apparatus should be regulated by means of a thermostat placed in the outflowing hot milk. This particular means of controlling the milk temperature is not now in use, but it would be undoubtedly an ideal way to control such temperatures and is practicable to use.

Fourth: The temperature at which the milk is heated *must* be automatically recorded and for convenience should be automatically controlled.

Fifth: The holding apparatus whether it be an absolute or a continuous process, should be so constructed as to definitely insure the holding of every particle of the milk without fail for the desired length of time. An automatic temperature recorder is desirable upon the holder.

Sixth: The cooler should be so constructed and arranged that the milk is cooled rapidly to a temperature as near 40 degrees F. as possible, and with no exposure to contaminated air; and the milk should be kept cold until delivered to consumers.

Seventh: The milk, especially after pasteurization, should be protected against contact with any unclean apparatus, or with infected or dust-laden air.

Eighth: The use of rubber fittings or gaskets should be avoided.

Ninth: Containers should be thoroughly and, if possible, automatically washed and sterilized, and stored in an inverted position until filled. The washing and rinsing of bottles by means of jets of hot water has been found to be more effective than jets of steam in reducing the bacteria in bottles. In any washing machine, the last rinsing water should be absolutely fresh, hot water, and as near the boiling point as possible.

As to specific makes of apparatus in use, it is of course not proper to recommend any particular kinds, but it cannot be considered amiss to indicate the advantages and disadvantages of the various kinds as shown by actual experience.

HEATERS.

There are five typical forms of apparatus in use for the heating of milk.

First: The Danish heater which is sold under various names depends for its operation upon the throwing by centrifugal force of a body of milk against the inner surface of a steam-heated cylinder or drum. The chief advantages of this form of heater are its comparatively small cost, and the ease with which it may be cleaned. Its disadvantages are that the heating surface is so small for the amount of milk treated that it is necessary to keep the heating surface at a temperature far above that to which the milk is to be heated. With a fluctuating flow of milk some of the milk is in danger of being scorched and some may not be heated hot enough. A uniform temperature for the milk is difficult to obtain.

Second: Several firms make various forms of heater in which the milk flows between two or more water-heated upright cylindrical surfaces. In each of these some method is employed to keep the milk which flows upward through the heater in rotary motion, thus insuring that all portions of the milk come in contact with the heating surfaces. These machines

are effective, those being the most satisfactory in which the greatest amount of hot water is available to heat the milk, thus making it possible to use water which is at a comparatively low temperature. Those forms of heaters which employ the regenerative principle, making use of the inflowing cold milk to cool the outflowing heated milk are only valuable for pasteurizing milk in New York City when it is possible to hold the heated milk for a definite time before returning it to the machine for regenerative purposes. Some machines economize heat by employing the warm water from the coolers for warming the cold milk flowing to the heater. This is a satisfactory method.

Third: The tubular system of heater is made by several concerns. In all these heaters the milk flows through tubes which are enclosed in hot water jackets, the hot water flowing in a direction opposite to that in which the milk flows thus using the maximum heating power of the water and also raising the temperature of the milk gradually to the highest point. This method of heating is satisfactory, those machines being the most efficient in which the flow of milk is slow enough or which have sufficient heating surface to insure that all portions of the milk will reach the maximum temperature. In choosing a machine of this type great care should be taken to secure one which may be easily cleaned, especially at the joints and turns, and one also where there is the least danger of the heating water becoming mixed with the milk in case of leakage. One objection to this form of heater is that owing to the very slight inclination of the pipes from the horizontal, it is very difficult to empty all the milk from the machine when the work is finished for the day. One strong advantage of this type is that it may be very thoroughly sterilized by live steam under pressure if desired after washing.

Fourth: The tank system of heating milk is employed. Such heating tanks are made by several firms. These horizontal tanks are surrounded by water jackets through which hot water is forced. They also have either hollow revolving screws or coils of pipe through which hot water is pumped. In these tanks the milk reaches the maximum temperature rather slowly but the heating may be checked instantly when the desired temperature is reached, and the milk may be held at this temperature as long as desired and the tanks then emptied. The automatic temperature records made when this form of heater is used are most complete and satisfactory. For small milk dealers who wish to pasteurize only the amount of milk which would be contained in one tank this would seem to be a very satisfactory and economical method, since one tank could be used as a heater, holder, cooler and a storage tank. When used as a cooler, cold water or brine takes the place of the hot water in the jacket and screw. There is this objection, however, that the cooling takes place rather slowly unless very cold brine is used.

Fifth: Another process of pasteurizing milk consists of heating the milk in the bottles which have previously been filled with the raw milk and then sealed. These filled bottles are either placed in a tank of hot water or else are subjected to a shower of hot water. After heating and holding for the desired length of time the milk and the bottles are cooled by subjecting them to cold water. By this system the bottle and its cap are pasteurized at the same time the milk is treated, and all subsequent infection of the milk is avoided. This appears to be an ideal method of pasteurizing from the scientific viewpoint. Objections to it are commercial ones, among which may be named the extra expense involved; the necessity of having an air space between the milk in the bottle and the cap to allow for the expansion of milk when heated, which allows the churning or shaking of the milk when handled and the consequent destruction of the cream line; also that whatever offensive odors may be contained in the raw milk have no chance of escape during heating.

HOLDERS.

There are two general methods of holding milk after heating.

First: The *Absolute method*. By this method the heated milk is placed in separate tanks or compartments from which it is automatically released by a mechanical device at the expiration of the time for which it is desired that the milk be held. This method is entirely satisfactory provided that no serious loss of heat occurs during the holding process, and that every particle of milk remains in the holder for the required length of time. In installing a holder of this type milk dealers should select one which is easily cleaned and has the fewest pipes and valves, and is the least likely to get out of order. Also those which develop the least amount of foam while in use are the most satisfactory. Some forms of absolute holders have the tanks surrounded with hot water jackets to prevent the loss of temperature in the milk. While this is satisfactory, it is doubtful whether the extra expense involved in so jacketing the tanks is necessary, provided the holding tanks are so insulated that the temperature will not fall below the maximum heat required. The surface foam is often many degrees cooler than the milk beneath it resulting in incomplete destruction of the bacteria. Some holders are now made in which the tanks are filled from the bottom, thus preventing the formation of foam.

A second method of absolute holding is the use as holders of the tanks in which the milk has been heated. This method has been described under the heading of heaters. (Page 10) This is a very satisfactory method.

Second: The *Continuous method*. By this method the heated milk is so delayed or retarded in its flow toward the cooler that it retains its temperature for varying lengths of time depending upon the efficiency of the apparatus. In all holders of this type it has been found by means of tests

made with color solutions while the apparatus was being operated with water instead of milk, that there is a mixing or diffusion of the liquids so that these machines never have 100% of their theoretical efficiency as holders. Three general types of continuous holders are available for use.

(a) The upright cylindrical tank in which the milk enters at the top and flows out at the bottom when the tanks become filled. These tanks are used either singly or arranged in series of two or three or more. Single tanks are seldom satisfactory and are not recommended. Depending upon the manner and form of construction, these tanks have a holding efficiency of from 25% to 50% of their theoretical capacity. One disadvantage of this type, when large, is the difficulty of cleaning.

(b) Horizontal tanks in which cross partitions retard the flow of milk from one end to the other. In the best forms of these tanks, the tests have shown that an efficiency of from 10% to 15% of their theoretical capacity is possible.

(c) Horizontal tubular holders in which the milk flows backward and forward through a series of tubes; the milk entering at the top of the series and being discharged from the lower tube of the series. This form has been found to have an efficiency of from 80% to 85% of its theoretical capacity. The same difficulty in emptying this form of holder has been observed which has already been noted in emptying the tubular heaters. This is due to the very slight incline or grade of the pipes from the beginning to the end of the series. The cleaning of the tubes must be done with great thoroughness.

In any form of holder great care should be taken when in use to have it thoroughly heated with steam before filling with milk since otherwise the first milk passing through the apparatus will lose much of its heat and there will be a failure to thoroughly destroy the bacteria contained in the milk.

COOLERS.

There are three general types of coolers in use.

First: The open cooler where the hot milk flows over the outside of a series of water or brine cooled pipes. In this form of apparatus the temperature is quickly reduced to a low point provided the hot milk is not allowed to flow too quickly and a sufficient number of cooling pipes are employed. The objection to this form is that the milk is exposed to the air unless the cooler is protected by covers, or is located in a separate room, the air of which is free from dust and bacteria. Where covers are provided for such coolers it is rather difficult to thoroughly clean them and keep them clean. It is rather difficult also to sterilize these coolers since in most of them steam can only be thrown against the surface of the cooler and cannot be confined or applied under direct pressure. It might be fea-

sible to provide tight covers for these coolers so that steam under slight pressure could be used.

Second: The cooling may be accomplished in the same apparatus in which the milk is heated or in an apparatus of similar character the hot water having been replaced by cold water or brine. When this method is used the milk is not exposed to the air and there is this advantage also that the apparatus may be thoroughly sterilized by steam.

Third: The tubular heater. In this form the pipes through which the hot milk flows are enclosed in other pipes or compartments through which cold water or brine flows. This method of cooling is effective and the apparatus may be easily and thoroughly sterilized by steam. The difficulty of emptying the milk from these pipes, which has been noted in describing the tubular heater and holder, also is here no evidence.

BOTTLE WASHERS.

The ideal method of washing milk bottles is to first wash them by hand upon revolving brushes and then pass them through an apparatus where they are subjected to the heat and rinsing of hot water and finally to live steam. Various mechanical automatic bottle washers are made by several manufacturers, each of which do good work. Care must be taken, however, to make sure that the final rinsing water has a temperature of at least 180 degrees F. This temperature may be secured either by means of a thermostat attached to the rinsing tank or by using a machine which by its form of construction requires this high temperature in order to become mechanically operative. All bottles after washing should be inverted and kept in this position until the process of filling with milk commences.

It is important that milk, after being pasteurized, shall not become in any way reinfected with dangerous bacteria. The greatest danger of such infection is due to the practice of capping the filled bottles by hand. When this method of capping is used, the caps are frequently kept in open boxes beside the bottling machine, and sometimes in the pockets of the workmen who are employed in capping the bottles. There is thus constant danger of the caps becoming infected either from the air or from the hands of the persons who handle them. Some form of automatic capping machine is extremely desirable and may be said to be a necessity. Various such machines are on the market and are being used to a considerable extent. Those machines are the most satisfactory in which it is possible to use the caps which have previously been kept in sealed and sterile containers or tubes before being inserted in the machine. Those capping machines should be chosen which miss the fewest number of bottles when in actual operation. When a great number of bottles are missed in capping it is necessary to readjust the caps by hand and thus all dangers which are present in the ordinary process of hand capping are also repeated here.

TROPICAL DISEASES IN CUBA

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Havana, Cuba

Read before the American Public Health Association, December 6, 1911, Havana, Cuba

The purpose of this paper, or rather of this note, is to call attenton to an interesting point in the conditions of public health in Cuba, within the past few years, that is, since the time when nationalization of all the sanitary services of the country began to exert its beneficial influence, and especially in regard to so-called Tropical Diseases.

Cuba, on account of its geographical situation within the north tropical zone, with a mean annual temperature of 24 to 25 degrees Centigrade, finds itself in the most favorable condition for receiving, developing and propagating a multitude of diseases peculiar to warm climates; but fortunately this does not occur. Tropical diseases, properly speaking, in the strict sense of the term, may be said not to exist in Cuba at the present time, as I shall endeavor to show in the course of this note.

According to the official census prepared by the Department of Government, the population of the Republic of Cuba, on June 30, 1910, reached 2,220,278, a figure which may be considered below the real number on account of the increase which immigration and natality produce, but which increase has not been fully estimated because it has not been possible as yet to obtain a complete registration of these two sources of growth of the population for causes which we need not enter at present.

The coefficient of mortality in 1910 for the entire Republic was 15.21, and in 1909, 13.03, which shows an increase from one year to the other of 2.18, to be distributed, according to the authoritative opinion of Dr. Le Roy, Chief Statistician of the Department of Sanitation, to the increase in population and especially to natality, and in part also to grippe which caused an unusual number of deaths in 1910.

In spite of the small increase referred to, the annual death rate of 15.31 continues to keep Cuba at the head of the two countries which have the lowest mortality in the world, with an increase in favor of the native population, comparing the figures of births and deaths, of 42,862 inhabitants. Having completely eradicated from Cuba smallpox for a number of years, and yellow fever since December, 1908, which were the scourges causing the greatest havoc and terror to the public health of the island, it is possible for me to say that we have only, as problems to be solved, malaria, tuberculosis and infantile enteritis; three problems, however, which are not directly related to tropical pathology, since these diseases are cosmo-

politan and constitute, as is well known, the constant preoccupation of the world.

And yet, malaria has virtually ceased to be a problem for us. In combating the cause of yellow fever by extinguishing the *stegomyia calopus*, we also combat and extinguish ipse facto, the *anopheles*, which are the propagators of malaria, and also the other genera and species of mosquitos which are responsible for other infections. It is possible to affirm absolutely that malaria no longer exists in the city of Havana, and that each year the cases in other parts of the island become rarer. Dr. Le Roy has been able to prove that in 1900 the deaths in Cuba from malaria reached 4,107, a figure which has been steadily decreasing to 617, in the year 1910, for the entire Republic.

In order to control infantile mortality and tuberculosis as far as possible, the Department of Health and Charities of Cuba has been putting into practice all measures which modern hygiene recommends and which experience has shown to be most effective in other countries.

Now let us ask. What tropical diseases are to be found at present in Cuba? As a matter of fact, the nosological classification which is offered us in their respective works by such authors as Corre, Manson, Le Dantec, Jackson and others is with difficulty applicable in the case of Cuba. Reviewing one by one the tropical diseases described by the authors mentioned, we find that only a very few have place in our pathology, especially after the proclamation of the Republic.

The following diseases are unknown in Cuba: trypanosomiasis, kala-azar, relapsing fever, bubonic plague, pellagra, epidemic dropsy, epidemic gangreous rectitis, framboesia, verruga peruana, the ulcerative granuloma of the genitalia, oriental sore, and many other different affections which form the nosological classification of tropical diseases.

It is now many years since we have been visited by asiatic cholera; hemoglobinuric fever is becoming more rare every year; dengue may already be classified as a cosmopolitan disease; Malta fever has not yet been officially recognized as existing in Cuba, although certain cases have occurred which have been classified clinically, though not bacteriologically, as Malta fever; sunstroke is already so rare in Cuba that it is scarcely ever mentioned; beri-beri makes its appearance from time to time in scarce numbers in communities where hygienic precautions are not observed, dysentery decreases so rapidly that only 43 deaths were due to it in 1910; the abcesses of the liver and other affections of this gland are more or less rare; no case of madura-foot has occurred for many years, and likewise no case of ainhum, those which were observed being in subjects of the negro race born in Africa; chappa has not attracted in the past few years the attention, neither have other diseases which no longer have any place among us save in the annals of medical history.

Strictly speaking, the only tropical disease which at present exists in Cuba is filariasis, which is bound to disappear by the continuous action of combating the mosquito.

The state of public health in Cuba is, without doubt, admirable. And if to this we add, that in the country districts, in the expanse of the plains, in the thickness of the woods, and on the margins of the rivers, the traveler may move and rest in confidence and ease, because he is not threatened by poisonous serpents, nor poisonous insects, nor dangerous animals; it is not too much to say that Cuba is a land of promise which offers to its natives and to foreigners who visit its shores the products and benefits of a privileged soil and the necessary guarantees of health and life.

Professor Le Dantec in his excellent work on Exotic Pathology, on studying the health conditions of the Northern and Southern States of the American Union, establishes the general law, which he considers applicable to all the colonies of the Antilles, which he expresses in the following terms. The warm regions of America are not colonies fit for population by the white race. They are colonies for agricultural exploitation; but they are above all colonies for population by the negro race and half breeds.

The learned professor of exotic pathology of the Medical School of Bordeaux, could not have imagined that, in the course of time, and as the result of sanitary measures which have not yet become general in his country, the island of Cuba would offer to the world an even lower death rate than that of France, and would furnish to white immigrants from all countries more certain guarantees of health than any of the French or other European colonies throughout the world, with the only exception of Australia.

BOSTON'S DEATH RATE

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Boston's death rate for 1911 was 17.1, which is high compared with rates of most other large American cities.

The 1911 rates for the other cities having over 500,000 inhabitants were—Cleveland 13.55; Pittsburgh 14.94; Chicago 14.55; New York 15.22; St. Louis 15.36; Philadelphia 16.51; and Baltimore 18.43.

A brief analysis of these rates is desirable.

Typhoid Fever:—From typhoid Boston had the lowest rate of all the cities. The rates per 100,000 were as follows:—Boston 9.14; Chicago 10.78; New York 10.99; Philadelphia 14.11; Cleveland 14.46; St. Louis 15.56; Pittsburgh 25.81; and Baltimore 27.28.

Scarlet Fever:—The rates were Baltimore 7.79; Pittsburgh 9.95; Boston 10.74; Philadelphia 11.33; New York 13.25; Chicago 21.20; St. Louis 27.26; and Cleveland 31.12.

Diphtheria:—The rates were Baltimore 12.05; St. Louis 16.84; Boston 18.00; Cleveland 21.94; Pittsburgh 23.60; New York 25.84; Philadelphia 31.51; and Chicago 39.11.

Measles:—The rates were Chicago 5.75; Cleveland 6.63; Pittsburgh 9.59; Boston 10.74; New York 13.25; Baltimore 13.63; St. Louis 15.84; and Philadelphia 19.30.

Whooping Cough:—The rates were Chicago 2.45; St. Louis 4.57; Philadelphia 7.34; New York 7.75; Baltimore 8.50; Cleveland 14.80; Boston 15.68; and Pittsburgh 19.54.

Taking all these diseases together, Boston had the lowest rate with 64.30 per 100,000; the others in order were Baltimore 69.25; New York 70.88; Chicago 79.29; St. Louis 80.07; Philadelphia 83.59; Pittsburgh 88.49; and Cleveland 88.95.

Tuberculosis of the Lungs:—The rates per 100,000 were Cleveland 121.77; Pittsburgh 130.88; St. Louis 135.29; Boston 154.88; Chicago 165.98; New York 177.39; Philadelphia 187.31; and Baltimore 205.12.

This analysis of the communicable diseases should be extremely gratifying to the people of Boston. However, it fails to reveal the reason of Boston's higher rate. But a study of the figures for 1910, for which year more complete figures are available, will show much more.

The following rates for 1910 are from Bulletin 109 of the Census Bureau:—

1910—Rates per 100,000

Cities

Cause of Death	Cleveland Ohio	Pittsburg Pa.	Chicago Ill.	New York City	Philadelphia	St. Louis	Boston	Baltimore	Boston 1910 per cent of total deaths non-residents
All causes	1427.2	1793.7	1514.0	1599.8	1739.9	1579.4	1716.1	1921.8	11
Typhoid	17.9	27.8	13.7	11.6	17.5	14.9	11.3	42.0	15
Malaria	0.2	0.4	0.5	0.7	0.5	4.9	0.1	2.0	.....
Small Pox	0.4	.....	.....	0.1	0.3	.....	.....	.....	.....
Measles	17.0	33.1	8.7	14.4	10.6	9.3	14.2	3.6	4
Scarlet Fever	12.6	22.2	18.4	20.0	9.8	27.1	9.2	8.6	15
Whooping Cough	6.6	14.4	7.9	5.9	20.5	8.3	7.6	15.2	2
Diphtheria and Croup	21.3	25.4	37.4	35.6	30.8	16.1	23.9	11.4	6
Influenza	9.0	14.2	6.6	6.1	10.2	18.7	7.6	11.4	10
Erysipelas	5.5	4.1	4.1	6.2	5.1	2.6	8.3	7.3	8
Tuberculosis of Lungs	127.2	104.2	158.3	185.0	193.5	166.7	171.7	228.0	7
Tuberculous Meningitis	10.8	12.5	10.1	17.0	11.8	6.5	21.5	10.2	10
Other forms of tuberculosis	8.5	13.1	9.6	9.0	11.6	11.7	11.4	12.7	3
Rheumatism	10.1	7.7	7.4	8.1	7.8	8.1	6.4	7.0	4
Cancer	73.1	65.6	82.2	78.0	85.0	85.1	104.5	96.2	16
Diabetes	13.3	8.6	15.9	18.6	16.1	12.9	20.8	18.1	6
Meningitis	10.5	13.6	9.7	11.4	7.7	10.9	15.6	22.2	1
Cerebro Hemorrhage and Softening	62.3	65.2	39.1	54.9	75.0	58.2	91.6	91.1	7
Organic Diseases of Heart	102.7	125.9	134.0	137.4	173.1	131.3	201.1	173.7	8
Bronchitis	39.0	52.7	7.8	28.9	33.5	44.5	24.6	30.9	5
Pneumonia	127.3	323.7	240.8	222.9	167.1	160.4	213.0	191.4	6
Other respiratory diseases	15.3	26.0	9.2	14.9	23.1	16.5	11.9	21.4	19
Diarrhœa and Enteritis under 2 yrs.	169.9	177.3	159.9	123.1	150.3	86.5	100.6	114.2	12
Appendicitis	14.5	11.2	14.8	13.1	11.9	10.7	16.3	12.3	30
Hernia intestinal obstruction	11.5	13.6	11.9	12.1	14.2	16.7	13.8	15.7	28
Cirrhosis of Liver	16.3	18.1	17.6	20.4	18.1	30.5	14.4	13.0	8
Nephritis, Brights Disease	94.0	74.7	113.9	142.6	171.9	165.4	89.5	178.5	9
Puerperal fever	9.0	13.3	8.1	7.8	9.1	9.7	5.6	6.1	29
Other puerperal affections	8.0	9.2	7.2	8.9	9.5	6.7	8.3	10.4	24
Congenital debility and malformations	72.9	94.3	53.1	81.0	74.5	67.2	89.5	123.9	7
Violent Deaths excluding suicide	83.5	134.3	95.4	78.3	83.6	87.6	95.9	78.8	21
Suicide	18.3	22.8	20.9	16.9	19.8	28.9	15.3	14.5	14
Ill defined and unknown	4.1	19.6	1.6	15.1	17.5	6.8	17.2	52.2	10
All other causes	233.9	245.1	188.5	194.6	249.0	247.9	273.2	297.7	16

Cancer, cerebral hemorrhage, organic diseases of the heart, pneumonia and violent deaths stand out as the principal causes which have comparatively high rates in Boston.

Again, the large number of deaths of non-residents in Boston is one of the greatest factors in raising the death rate, as has been pointed out repeatedly by the statistical division of the Boston Board of Health.

In 1910 there were 1280 such deaths, and in 1911, 1348.

If such deaths be deducted, Boston's rate for 1911 becomes 15.11.

While Boston's rate is thus raised 2 by deaths of non-residents, estimates indicate that Chicago's rate is raised only .5 by such deaths and New York still less.

There are two reasons why Boston has such a large number of deaths of non-residents. First it has a population in its immediate suburbs greater than the population of the city itself. These people labor in Boston and when ill come to Boston hospitals. The other reason is that Boston is the recognized medical centre for all New England and attracts those

afflicted with cancer, for example, a disease more prevalent in the New England States than in any of the other registration states.

Moreover in 1910 Boston had a larger percentage of its deaths over 6 years of age than any of the cities under consideration. In a word, Boston is an old city and has many old people.

With the figures already given, together with the knowledge that a large portion of Boston's population is of foreign composition, unfavorable to a low death rate, it is not difficult to understand why Boston's rate is comparatively high.

Further analysis by age periods and various mother nativities will be possible when the detailed census population figures are given out from Washington.

But in a word it may be safely said that Boston's high rate is largely due to its geographical position in the centre of populous suburbs, and to its fame as a medical centre, and not, as has been so often intimated, to the unhealthful conditions in the city.

HISTORY OF THE ADOPTION BY THE NATIONS OF THE AMERICAN CONTINENT OF THE BERTILLON NOMENCLATURE OF DISEASES AND CAUSES OF DEATH

Dr. Jesús E. Monjarás

Mexico

Read before the American Public Health Association, Havana, Cuba, December, 1911

Those who occupy themselves with statistical labors, have understood for the last half century, the necessity of forming, amongst others, statistics and tables of mortality.

This was the object which gave rise to the International Congress of Statistics, and after holding several meetings in different countries, the Congress reached the conviction that uniformity of International Statistics, which would render them comparable, was a much more difficult task than was at first supposed.

In 1885, the principal Statisticians of Europe, met in Paris and afterwards in London. In this city, the International Institute of Statistics was founded with the object of establishing the desired uniformity.

This institute has held several meetings in different countries, always pursuing the same object without attaining it, because, although each country recognizes the necessity of presenting statistics that can be compared with those of other nations, it always considers that the other countries should conform to its own system, so that it may be able to compare the present with the past data, and for this reason, each has for a long time refused to change its methods for the advantage of international comparison.

On this continent, including the United States of America, the American Public Health Association, which has the largest membership of any society of its class, and of which I have had the great honor to fill the Office of Vice-president on several occasions, has occupied itself, amongst other matters, with the revision of the nomenclature of diseases and form of statistics, appointing in 1889 a special International Committee to study and propose the most suitable reforms in that branch, of which committee I was appointed a member.

Its learned President, Dr. Samuel W. Abbot, Secretary of the Board of Health of the State of Massachusetts and an able hygienist, requested my opinion on the subject.

In answer I proposed the system advocated by Dr. Bertillon of Paris,

which I had already implanted in San Luis Potosi since the year 1892, after a careful comparative study which I made in the offices of the respective countries, of the English, German, Italian, French and American nomenclatures, and which had been proposed to the Sanitary Offices and Government of this country. (See Annex num. 3, page 310, of the Proceedings of the Second National Medical Congress.)

The other members of the committee called me to a conference in Montreal, Canada, in the year 1894, and there I was able to persuade those gentlemen to adopt the Bertillon System, against the English, and it was shortly after adopted throughout Canada.

The committee which was charged with the study of the different forms of statistics, continued its negotiations in the same sense and obtained from the Association an official declaration in favor of that nomenclature, and the adoption of the following resolutions:

Resolved: That the American Public Health Association recommends that the Bertillon classification of causes of death be adopted by all the statistical offices of the United States, Canada and Mexico, as soon as the change from the present systems can conveniently be made.

Resolved: That the Committee on Nomenclature of Diseases and Form of Statistics, be authorized to order printed and circulated among the statistical offices of the three countries, a circular which will give a knowledge of this resolution, the report of the Committee on which are based the three forms of Bertillon classification, with explanatory notes on the terms employed and practical rules for their compilation, with a list of the statistical offices which have accepted it.

Resolved: That the committee propose an international agreement between the statistical offices of the three countries represented in this Association, and the same offices in France and other countries which now use or hereafter may use the Bertillon System, and that a definite scheme for such alliance be submitted to the next annual meeting of this Association for action.

Resolved: That the Governments of the United States, Mexico and Canada be also invited to adopt this classification, as a basis for the mortality statistics in the census of 1900 and 1901.

In the meeting of the Association which was held in Ottawa, Canada, from the 27th to the 30th of September, 1898, the above resolutions were adopted together with the following, which were moved by the same committee.

Resolved: That the American Public Health Association approves the general principles and plan for the periodical revision of the Bertillon classification of the causes of death, as presented by the Committee on Demography and Statistics.

Resolved: That subject to the approval of the Executive Committee,

the President of this meeting of the American Public Health Association appoints committees of three members from each of the countries represented in the Association who will work together and with other similar committees in other countries, on the revision of the Bertillon classification of causes of death; and that such committee be authorized to adopt the necessary regulations which, in combination with other countries associated in the work of revision, may appear necessary for their good administration; that in each annual meeting of this Association, the committee should report on its action, and continue in office until the work of revision is completed and its successors elected for the next periodical revision.

The members appointed under the above resolutions were the following:

Canada	Dr. Emmanuel P. Lachapelle, Montreal, P. Q. Dr. Peter H. Bryce, Toronto, Ont. Dr. Elzéar Pelletier, Secretary, Montreal, P. Q.
Mexico	Dr. Eduardo Licéaga, Mexico, Mexico. Dr. Jesús E. Monjarás, San Luis Potosí, Mex. Dr. José Ramirez, Secretary, Mexico, Mex.
United States	Dr. Samuel W. Abbot, Boston, Mass. Dr. A. C. Young, Augusta, Me. Dr. Cressy L. Wilbur, Secretary, Lansing, Mich.

Our committee did not confine itself to advocating this system amongst all the states of our Confederation, but also forwarded its proposals to the Southern country, and with great success, as almost all of them had adopted that classification by the end of the year 1900.

Immediately after the International Congress of Medicine and Hygiene, which was held in Paris in the year 1900, the Statisticians met to again discuss the adoption of a uniform nomenclature for death, and powerfully influenced by the remarkable circumstances of the uniform opinion of all the nations of this continent on a subject of such important results for humanity and science, the European nations did not delay in almost unanimously adopting the nomenclature devised by the learned statistician Bertillon, which had been adopted for the first time in this country by myself, as I have already stated.

FURTHER STUDIES ON THE VIRULENCE OF DESICCATED RABIC MATERIAL

D. L. Harris

St. Louis

(Abstract.)

Read before the Laboratory Section, American Public Health Association, December, 1912. Havana, Cuba

A previous paper describes a method of vacuum desiccation of rabic material which preserves its virulence for several months. The essential feature of this process is the maintenance of a temperature several degrees below 0°C. during desiccation in vacuo.

Tests made to determine the amount of virulence in the dried material show this to be approximately 1 per cent of the original virulence.

Various modifications of the method were attempted in order to secure a greater conservation of virulence. It has been found that, if the material be frozen with CO_2 snow and desiccated as in the original method described by Shackell, the dried powder contains from one-third to one-half of its original virulence.

Rabic material so treated is virulent in dilutions of 1-5000 and 1-10,000. This virulence diminishes very slowly. After having been preserved for several months, it still possesses active immunizing properties.

Work is now being carried on to determine (1) the rate of loss of virulence; (2) the effect of temperature, light and chemicals on the loss of virulence; (3) the immunizing value of the dried material.

PRODUCTION OF ANIMAL VACCINE VIRUS. DOUBLE COLLECTION

DR. V. DE LA GUARDIA

Director of the General Vaccine Institute, Havana

Read before the Laboratory Section, American Public Health Association, Havana, December, 1911

The General Vaccine Institute of the Republic of Cuba was founded in 1901, during the first American occupation of Cuba, being governor of the country, General Leonard Wood, who had as his Secretary of the Interior Dr. Diego Tamayo under whose department Institute was a dependence.

The establishment of the Institute, as well as the propagation of the vaccine over the Cuban territory, all that, was due to the initiative and energies of Col. Valery Havard a worthy sanitary chief of the Army Occupation.

The introduction of the vaccine in the island of Cuba was due to a most illustrious man of sciences, a true sage in all senses and particularly for that time, Dr. Tomas Romay. The event took place in the early days of February, 1804. From that time small-pox vaccination in our territory has been known and propagated.

The propagation of the vaccine was under the patronage of the Cuban Economical Society and among its advocates, besides Dr. Romay, the names of Drs. Cozar, Perez Delgado and Messrs. Sanchez Rubio, Bernal Castellanos, Rolland, Navarro, Parra, Perez, Carrillo, Lezama, Gorin, Joaquin Navarro and Leon Valdes should be mentioned. Sometime afterwards, Drs. Rafael Hondares and Tomas Mateo Govantes as well as Dr. Angel Cowley, professor of the Therapeutics of Havana University and secretary of the Board of Health deserve equal praise.

To the Academy of Sciences of Havana undoubtedly is due in great measure, the propagation of small-pox vaccination, especially to the never-forgotten president, Dr. Nicolas J. Gutierrez, who with Dr. Zambrana, Dr. Mestre and the respected and beloved Dr. Ambrosio Gonzalez del Valle then, and in more recent times, Drs. Joaquin de Zayas, Luis de la Calle, Felipe Rodriguez, Luis Cowley, Pantaleon Machado, Jose Beato, Ramon L. Miranda, Gabriel Maria Garcia, Miguel Riva, Vicente Benito Valdes and others, all of whom were members of said academy.

The academy has at present a Vaccinating Commission which works with usual regularity. The work until recently was carried out by Dr. Gustavo Lopez, but today Dr. Jorge Le Roy is in charge of it.

The establishment in Cuba of an animal vaccine institution took place

in 1868; being its founder, Dr. Vicente Luis Ferrer, who on his own private initiatives and personal effort, put it in working order.

The Provincial Board of Health formed in 1878, approved warmly the creation of a Provincial Institute for vaccine and on the 28th of June, 1880, the equipment of said institute took place, due in part to the perseverance of Dr. Luis Cowley, the professor of Hygiene of Havana University. Since that time until 1901, when the General Vaccine Institute of the Island of Cuba was established, I have been the director of the same.

Until a short time before the end of Spanish rule in Cuba, vaccination was carried on regularly, once a week in the interior of our churches.

In the City of Havana there have existed some private institutes of animal vaccine; Matanzas and Santiago de Cuba also have had such institutions.

Presently, and since 1901, the General Animal Vaccine Institute supply vaccine virus, free, to all the Municipal districts of the Republic of Cuba, and at the Institute itself not only is vaccination carried on, but vaccine virus is supplied to all who applied for it.

The principal object of this contribution is to inform you of the production of vaccine virus since the foundation of the Institute.

All the details relative to this matter will be found in the accompanying table.

In the production of the virus, the Institute follows the method of Professor Degive, of the Brussels Veterinary School, director of the Vaccine Institute, which consists in the double collection from the same animal; the method is somewhat novel, it being used only in Havana and Brussels; but it is exceedingly simple. The first collection is made on the fifth day (five times in twenty-four hours); the second, takes place on the seventh day (forty-eight hours after the first collection), and the vaccine virus in so short a time, that is with reference to the interval between the first and second collection, germinates almost always in greater amount.

The average amount obtained formerly when only one collection was made, fluctuated between 60′14 grams as a maximum and 39′64 grams as a minimum for each animal.

With the double collection method the average amount fluctuates between 116′71 grams as a maximum and 81′50 grams as a minimum for each animal.

The beneficial qualities of our vaccine preparations (collection A. and collection B.) have been perfectly proven, in the first place, by daily use since 1906 (second semester) both virus giving satisfactory results; secondly, we have received satisfactory letters from Dr. Rosenau, director of the Laboratory of the United States Public Health and Marine Hospital Service of Washington, Dr. Blaxall of the London Government Lymph Establishments, and finally from Dr. Huddlestone of New York's Health Department.

Year	1-2 Year Periods	Animals Inoculated	Average weight of each Animal in Pounds	Average No. of Scarifications per Animal	Total in Grams	From each Animal Max. and Min.	Production of Vaccine—(Grams) 1st Collection. Total	1st Collection. From each Animal Max. and Min.	2nd Collection Total	2nd Collection From each Animal Max. and Min.
1901[1]	.....	73	.....	.....	3751	**51–38**				
1902[2]	.....	23	**290**	.....	917	**39–86**				
1903	.....	46	**275**	.....	2036	**44–26**				
	1st	27	**247**	**122**	1178	**43–62**				
1904	2nd	27	**268**	**115**	1102	**40–81**				
Total		54			2280					
	1st	28	**318**	**124**	1684	**60–14**				
1905	2nd	32	**279**	[3] **81**	1776	**55–50**				
Total		60			3460					
	1st	20	**272**	**49**	931	**46–55**	841	**40–05**	[5] 90	**45–00**
1906	2nd	13	**289**	**63**	919	**70–69**	401	**30–84**	518	**39–84**
Total		33			1850		1242		608	
	1st	20	**287**	**67**	1630	**81–50**	759	**37–95**	871	**43–55**
1907	2nd	15	**287**	**68**	1401	**93–40**	611	**40–73**	790	**52–66**
Total		35			3031		1370		1661	
	1st	21	**297**	**63**	1916	**91–23**	818	**38–95**	1098	**52–28**
1908	2nd	15	**327**	**64**	1415	**94–33**	595	**39–66**	820	**54–66**
Total		36			3331		1413		1918	
	1st	23	**318**	**64**	2172	**94–43**	960	**41–73**	1212	**52–69**
1909	2nd	23	**328**	**70**	2315	**100–65**	1122	**48–78**	1193	**51–86**
Total		46			4487		2082		2405	
	1st	24	**343**	**75**	2423	**100–95**	1192	**49–66**	1231	**51–29**
1910	2nd	14	**342**	**79**	1634	**116–71**	736	**52–57**	898	**64–14**
Total		38			4057		1928		2129	
1911	1st	21	**344**	**69**	1883	**89–66**	883	**42–04**	1000	**47–61**

[1] From August to January, 1902.
[2] From February to December.
[3] 31 animals were scarified.
[4] The Umeno scarifier was used from this time on. Previously the scarifications were made with the point of a bistoury.
[5] Double collection from the two animals only.

HEALTH DEPARTMENT REPORTS

Providence, R. I.

The death rate of Providence for 1911 was 15.56 per 1,000. Dr. C. V. Chapin, the Superintendent of Health, reports that this is the lowest death rate recorded during the 57 years of registration. Interesting reports are made of the work of medical inspection of schools, the school oculist and the dental inspector. It is interesting to note that at the urgent request of the Superintendent of schools a neurologist has been appointed to give careful study to backward and defective children.

Dr. Chapin again refers to the conclusion reached by him some years since that there is usually no very great extension of scarlet fever and diphtheria through schools. He states that it is generally the practice of this department not to exclude from school children in a house where there is scarlet fever or diphtheria, except children of the family in which the disease actually exists. If, however, it is believed that there will be no isolation, and that there will possibly be a mingling of all the children in the house, they are all excluded. In the majority of instances the other children in the house are allowed to attend school.

"The rule in Providence is to exclude from school all children living in diphtheria families for four weeks from the beginning of the last case. But if two sets of nose and throat negatives can be obtained from each school child in the family at any time after the warning sign has been removed, permits are given. (The warning sign is removed ten days after the disappearance of the exudation.) When the four weeks have elapsed, even if diphtheria bacilli are found, school permits are nevertheless given."

It is worth noting that only 118 disinfections were performed. It will be recalled that disinfection after communicable disease in this city is not compulsory and is only done when desired by the family.

Dr. Chapin gives figures to show that recurrences of diphtheria and scarlet fever are entirely independent of disinfection, or the lack of it.

Maritime quarantine had become negligible in Providence until this year, when the Fabre Line commenced disembarking immigrants at that port. On account of the presence of cholera in Italy, bacteriological examination of the immigrants was established. No cholera carriers were discovered. Dr. Chapin points out the necessity for providing Providence with a properly equipped quarantine station, etc., and states that unless the city council is willing to incur such an expense, that the Federal Government ought to be asked to take charge of quarantine at this port.

Dr. Chapin's report contains as usual very valuable statistical information with regard to communicable diseases. It would be distinctly advantageous if all other large cities would present their figures of communicable disease as clearly as those contained in this report.

Winnipeg, Manitoba.

Dr. A. J. Douglas, the Medical Health Officer of Winnipeg, presents an unusually full and attractive annual report. The gross death rate for 1911 was 12.8 per 1,000. This is an improvement of nearly 1% over 1910. Dr. Douglas points out wisely that "it should be borne in mind, however, that our population is very largely made up of persons in the prime of life who are constantly arriving here from other parts of Canada and from the older lands. Stable conditions have not yet been reached nor will they be while this great wave of immigration continues. Therefore, while we may congratulate ourselves on a low death rate, we should, nevertheless, aim to arrive at

conditions which, with a population so favorably constituted as regard age, will make it possible to reduce this rate still more."

The infant mortality rate was 165.1 per 1,000 births. This was higher than the rate in 1910, the increase being accounted for by a severe outbreak of scarlet fever occurring in the early part of the year. There was 7% less deaths of infants from acute gastro-intestinal diseases than in the previous year. The death rate for typhoid fever was 7.9 per 100,000. This is considered, and naturally so, to be a most satisfactory showing and, when compared with the rate of 248 in 1905, furnishes an illustration of what can be done by cleaning up. Scarlet fever was the greatest problem with which the authorities had to deal in 1911. 1,030 cases of this disease were reported and 124 deaths. Contact infection seemed to play the most important part in the outbreak.

The report contains full information with regard to the collection and disposal of refuse. Students anxious to study costs of collection and disposal by cremation will find much of value in this report. The section of the report dealing with the work of the Food and Dairy Commission is very full, and speaks well for the energy and ability of P. B. Tustin, the chief of this division. Space forbids further comment on this excellent report. It is extremely well printed and illustrated.

PUBLIC HEALTH NOTES

Occupatic nal Diseases.

Dr. H. Linenthal, one of the Massachusetts State Inspectors of Health, in a paper on the Prevention of Occupational Diseases, in the May 23, 1912 issue of the *Boston Medical and Surgical Journal*, summarizes very clearly the measures to be adopted to prevent the ill effects upon health from industrial processes or conditions. They are as follows:—

1. To collect complete and accurate data about industrial processes and about conditions under which the various industries are carried on.

2. To obtain more accurate and detailed information relative to occupation on morbidity and mortality records.

3. To instruct the medical student in this important field of preventive medicine by a course of lectures on the more important industrial processes and the diseases to which they give rise.

4. To place the specific industrial diseases on the list of diseases notifiable to the central health authority.

5. To examine periodically all workers in certain industries, these industries to be named by the central health authority.

6. To exclude minors and women from certain industries which are designated by the central health authoritiy as injurious to health.

7. To have adequate laws regulating sanitary conditions and protective devices in industrial establishments, and to have such laws intelligently enforced.

8. To have the central health authority issue regulations for certain dangerous trades with instructions to employers and employees how to guard themselves against the ill effects of their work, and to have such instructions posted in the workrooms.

9. To carry on an extensive educational campaign both among employers and employees as to the value of protective measures and good sanitary conditions.

The Composition of Expired Air.

A review of the literature of this subject, discussing the relative importance of its physical and chemical characteristics, appeared in the Monthly Bulletin of the State Board of Health of Massachusetts for April. The author, Dr. H. Linenthal, State Inspector of Health, after considering the work of Pettenkofer, Brown Sequard, D'Arsonval, Billings, Wolpert, Flügge, Rosenau, and others, expresses his conclusions as follows:

"From the review of the above literature it can be seen that while the question as to whether the expired air contains any substances injurious to the animal organism is still regarded by many as unsettled, in view of the thorough experimental work by many competent observers it can no longer be questioned that temperature and humidity are factors of extreme importance in determining the proper ventilation of premises, and that careful attention to these factors is of greater importance than the determination of carbonic acid gas."

School Ventilation.

A valuable contribution to school ventilation is to be found in the June 7, 1912 issue of the Metal Worker, Plumber, and Steam Fitter, from the pen of Mr. Frederic Bass of the Minnesota State Board of Health.

Experiments have been made in the ventilation of school rooms, by individual air ducts, each desk being equipped with a fresh air funnel. An experimental plant was designed to distribute the air in the school room of one of the Minneapolis public schools, so that all scholars would receive equal quantities and the same quality of air.

"The air to be delivered to the pupils in the room was taken in through a window in the basement and passed over two Vento radiators to a Webster air washer and humifier, thence to a heating coil, from which the air was blown to the outlets in the room by means of a Sirocco blower. The main duct

from the blower was carried along the ceiling at one end of the basement room immediately below the room in which the pupils to be the subjects of the experiment were located and from it three ducts were extended parallel to the rows of desks. From these ducts, the air was carried through 2-inrisers extending through the floor to each desk in the room above, at which point it entered the room through funnel-shaped orifices."

"The plant was kept in operation for about four weeks, and during this time it was found possible to ventilate the room satisfactorily with the crude apparatus installed with 8 cu. ft. of air per minute per pupil. During the last few days the ozone apparatus was in operation, and although the cost of the current to operate it was but a few cents per day, a decided "freshening" of the air was noticeable. On four successive days, experiments to determine the mental ability of two selected groups of pupils were carried on by Professor J. B. Miner, of the University of Minnesota, first under this system and second under the old system of ventilating providing 25 cu. ft. of air per minute per pupil, but no perceptible difference in mental capacity of the pupils was noticeable. The test, however, was probably unsatisfactory on account of the short duration of the experiments.

It is expected during the coming year, with the permission of the Minneapolis Board of Education, to continue the experimental work from a physiological standpoint.

It is intended that this room, together with a similar adjoining room under the ordinary system of fan ventilation as a control, will be in operation. The environment of each child outside of the school building will be carefully recorded. The weight, blood-pressure, respiration, pulse and other necessary data will be obtained during a series of experiments lasting several months, and it is hoped that some connection between the physiological condition of a school child and the quality and quantity of air which he receives may be determined. The apparatus which has been described and which has been in use for over a month has shown conclusively that 8, and perhaps as low as 6 cu. ft. of air per minute per pupil will be sufficient for ventilation when it is properly distributed.

The cost of installation of such a system in a new building equipped with the new hollow standard desks acting as risers and with a modified funnel outlet, will not exceed that of the present ordinary systems when the diminished size of main ducts, fans and engines or motors is considered."

Housing in Hamilton.

Dr. Roberts, the Medical Officer of Health of Hamilton, recently made a preliminary report on the housing situation of his city. In all 260 families were visited and in many instances very unsatisfactory conditions were discovered, and Dr. Roberts points out that Hamilton, after having passed with comparative ease and safety through the dangers and diseases of infancy and childhood now finds itself in common with all rapidly growing cities, face to face at the threshold of adult life, with the chances of plague infection incident to the maturity of most urban communities. It is encouraging that Hamilton realizes its danger at the present time so that it can take the necessary steps to prevent the evils of bad housing to increase and to eradicate existing conditions.

Rural Tuberculosis Campaign.

The crusade against tuberculosis will be carried into the rural districts of the state of Wisconsin by the State Anti-Tuberculosis Association this summer. This work, which has never been done elsewhere, has been made possible by a gift of a motorcycle from a friend of the association.

Mounted on this machine, Mr. Theodore Werle, field worker of the association, will make a tour of the state, visiting villages and cross roads, and later in the year rural schools.

Besides a stereopticon with slides, an exhibit of seventeen charts, and literature for distribution, Mr. Werle carries a complete equipment for sleeping out of doors and doing his own cooking. Because he is not tied down by train schedules and can travel rapidly, he can reach enough people in a day to make country work practical.

In an attempt to take the gospel of good health to the country, where there is a great deal of tuberculosis, a lecturer and an exhibit were sent out last year with a team and a wagon, but the cost of keeping a team and the loss of time in getting from place to place made the work almost prohibitive. It costs less on the motorcycle, however, than traveling by rail, as it is possible to reach the most remote sections.

The Press and Public Health Work.

"No greater single agency for the advancement of public health education exists, than is found in the press of this State. Nor is there to be found anywhere a class of men more willing to assist in the uplift and upbuilding of their own community and of the State than the editors and managers of these newspapers.

During the last eight or nine months practically every one of the leading daily, weekly and semi-weekly newspapers and other publications of the State have from time to time been carrying more or less public health information in their columns. From the best available information it appears that something like 160 papers have been supporting this campaign for better health, happiness, and efficiency. The total subscription enrollment of these papers approximates 475,000. It would seem that there can scarcely be a home in North Carolina into which such health information has not found its way. If the total amount of health matter used by these papers in the last eight months were joined end to end, it would form a newspaper column approximately 161 miles long.

It is comparatively easy to compute the total amount of such printing done, but who can ever estimate the amount of good this is bringing to the people of the State? The great flood of inquiries for literature, bulletins and further information received at this office serves as a testimony or index to the eagerness with which the public reads such items. This is particularly noticeable when the papers advise their readers that certain health literature, bulletins and pamphlets can be obtained at this office.

If the newspapers and other publications of the State continue in the future as they have in the past, the public will soon know the cause and will apply ther emedy to many of the diseases and ailments affecting the life, health and efficiency of individuals and communities, which heretofore were supposed to be the dispensations of a beneficent Providence. Furthermore, it will be only a question of time until the public will demand the enactment and enforcement of such laws, State and local, that will look to the better safeguarding of the State's greatest wealth—the health of her citizens."

W. H. B.

Editorial, *Bulletin* (N. C.) *State Board of Health*, July, 1912.

6th Pan American Congress.

The Sixth Pan American Congress will convene in Lima the first week in August (3rd to 10th) 1913 in connection with the Latin American Medical Congress and the Congress of Hygiene.

It will be under the patronage of His Excellency the President of the Republic of Peru, and of the Minister of Foreign Relations of Instruction and of Fomentation.

The most distinguished physicians and surgeons in the country are in charge of the working of the various Sections of the Congress of which there will be eight in number, one of which will be devoted to Hygiene.

The Healthologist.

One of the most attractive health department bulletins which comes to our desk is the Healthologist, issued by the Health Department of Milwaukee, Wisconsin. It is extremely well printed and has many excellent illustrations. This bulletin must undoubtedly be of great educational value to the city of Milwaukee and Mr. F. W. Luening deserves much credit. The name seems somewhat unfortunate though.

Other cities might copy the Healthologist to advantage.

A Board of Health Tuberculosis Dispensary.

The town of Brookline, Massachusetts, is already noted among the thriving suburbs of Boston for its Public Baths and its Munici-

pal Gymnasium. It has also good playgrounds which last winter were turned,—many of them—into skating parks, by simply flooding and freezing.

Brookline has now taken another forward step by the establishment of a Tuberculosis Dispensary under the auspices of the Board of Health which, owing to the fact that Brookline clings tenaciously to the old New England form of "town government"—in spite of the fact that it is virtually a city, having a population of about 30,000,—is not really a Board of Health at all, but a Board of (five) "Selectmen" who are *ex officii's* "the Board of Health." That this Board, only one of whom is a physician, have been enlightened and progressive enough to establish a Tuberculosis Dispensary for Brookline, is due largely to the influence and efficiency of the Health Officer of the Board, Dr. H. Lincoln Chase.

The objects of the Dispensary are:—

1. To provide a free dispensary for the examination, treatment and assistance of persons who have tuberculosis, also for persons in poor health who may or may not be in the early stage of the disease and need to know in order to make an early and sure recovery.

2. To secure proper care for tubercular patients in their homes, where the dispensary nurse (an important and interesting adjunct) will visit them when desired and attend to their special needs.

3. To furnish free medical attendance in their homes when required by patients who are not in condition to come to the dispensary.

4. To co-operate with other agencies in the town to furnish special diet (milk, eggs, etc.), and such other aid as may be required.

5. To give advice and instruction as to the carrying out of proper treatment and as to the protection of other members of the family from infection.

6. To aid patients to gain admission to suitable sanatoriums and hospitals. Practically every tubercular patient in Brookline who needs it can be provided with proper sanatorium care.

7. To assist discharged hospital and sanatorium patients to prevent relapses.

Action of this sort on the part of any town or municipality is encouraging and creditable, and Brookline's example in this as in so many other aspects of public welfare work is worthy of wide imitation.

Mechanical Filtration.

"The day of retribution long anticipated by a few engineers has at last dawned for the mechanical filter. Years ago it was pointed out in this journal that the adoption of the term mechanical to designate the rapid sand filter would eventually produce confusion in the minds of city officials, and that is exactly what has occurred at Columbia, S. C. In the last annual report of the Water Department this statement will be found: The discontinuance of a bacteriologist at the filter plant, and the substitution of a competent mechanic to operate a mechanical system of filtration, is a most advantageous one for the city and water department. The water analysis will be in the hands of recognized competent officials and the filter plant will be safeguarded by a competent mechanic. The Water Department is now in a position to provide the best and safest means of protection to its patrons.

"The facts in this matter are decidedly interesting. For five years Columbia had a chemist and bacteriologist in charge of its water purification plant, enjoying the distinction of being one of the few municipalities in the South owning a purification plant which employed such a specialist for this purpose. But the curse of a bad name was too much to be borne, and so a machinist has been substituted for a chemist because the plant is a "mechanical" one. The introduction of this term in connection with water purification with water purification works took place so long ago that possibly a good many readers may not recall that it was due to the use of revolving rakes for stirring up the surface of the sand in the filter beds when they were washed. This mechanism has disappeared very largely from the municipal filters, and it was never anything but a mere mechanical detail, so that the designation of the filtration system involving the use of a coagulant by the term "mechanical" never had any

sound basis. And now that its logical result has followed in Columbia and a machinist has been substituted for a chemist to manage the filtration plant there, it is to be hoped that the rapid sand filter will not be called a mechanical filter by engineers to such an extent as heretofore."

Editorial, Engineering Record, Vol. 65, No. 23.

Dust Fever.

"An industrial disease which I have several times encountered but have never seen described, is well known among grain threshers as "dust fever."

I have found on inquiry that the ailment occurs also among flax hatchelers. As it is caused by the inhalation of dust in excessive quantities, it probably occurs in various occupations supplying this essential etiological factor. The only cases coming under my observation, however, have been among threshers, or farm laborers engaged in grain threshing.

Grain becomes musty when the curing process, during harvesting, is interrupted by rains; and the production of dust is thus greatly increased. This renders the work of threshing in the barn, as commonly done in the northern states, particularly disagreeable; and the laborers engaged, subject to the ailment. It is not improbable that certain elements in the dust possess toxic properties and that these, rather than the mere mechanical irritation of the particles, cause the trouble; but this is merely problematical.

Dust is mentioned, incidentally, by some writers as a cause of coryza; but the symptomatology of coryza is so mild, comparatively, that it apparently was never meant to include the subject of this article.

The sickness begins in the evening or during the night following the day's work in dust. The symptoms are severe; often alarming. There is a pronounced chill and usually vomiting. The face is flushed. Patient may be delirious and with a temperature as high as 104. There is marked congestion of the mucous membrane of the respiratory passages. The picture is not unlike that often presented at the onset of pneumonia in a robust subject.

The symptoms moderate during the second and third days. A copious exudation from the nasal and bronchial passages, eliminating microscopic quantities of dust."

Dr. F. J. Bowen in *New York State Journal of Medicine*, July, 1912.

Okanogan County, Washington.

Very few county Boards of Health publish monthly bulletins. An exception to the rule however is the Sanitary Digest, a monthly booklet published by the Board of Health of Okanogan County, Washington. Dr. H. M. Fryer, the county health officer, is the editor. The June 1912 issue is devoted to a report of the result of a visit of the health officer to the various towns throughout the county. It is certain that the publicity given to the sanitary or insanitary conditions of the various towns visited must be an incentive to them to develop a high sanitary status.

Purifying Thames Water.

"Purification of the Thames water by the addition of quicklime with subsequent dilution to rend it potable is suggested by Dr. A. C. Houston of the Metropolitan Water Board of London, England. Dr. Houston states that 15 lb. of quicklime, costing about 3 cents, added to 7,500 gal. raw water would kill the B. coli, and inferentially but certainly the microbes of epidemic water-borne diseases, such as the typhoid bacillus. The excess of lime would then have to be neutralized with 2,500 gal. or one-third of the volume of adequately stored water to render it potable. In this way 75 per cent of the water would be sterilized chemically and the remaining 25 per cent sterilized by storage. Subsequent to this treatment, rapid filtration alone would be required to remove the precipitate of inert carbonate of lime and to bring the water up to a reasonable standard of chemical purity. He states that this system would be more expensive than sand filtration, but would have certain distinct advantages, notably its adaptability, its special suitability for flood waters, its capacity to render an initially foul water absolutely safe in a reasonably short space of time."

Engineering Record, Vol. 65, No. 22.

Is the Health Officer's Work Worth While?

"We cannot magnify too highly the Health Officer and his work. It is a great achievement to make two blades of grass grow where only one grew before. It is a great achievement to make an acre of ground produce 100 bushels of corn where it only produced ten before, but what good can it do you when you are dead? It was a great thing to link two oceans together by steel rails, but you don't care to ride on the train when you are dead. It is a great achievement to link the two oceans together by the Panama Canal, but what will you care about it when you are dead? It is wise and proper that Congress should appropriate one hundred million dollars for good roads, and that the states and counties should use their convicts in building good roads, and that the counties, towns, and townships should issue bonds and use the proceeds in building good roads, but good roads won't be worth anything to you when you are dead. It is wise and proper that our Government should look well to the conservation of her natural resources, the conservation of her forests, the conservation of her water powers, the conservation of her coal fields, the conservation of her soil; but these, while important, are insignificant when compared with the conservation of human life.

In the economies of a nation there is nothing so important as the conservation of human life. It has been well said by Senator Owens, that the conservation and the efficiency of our people is a problem of the first magnitude, demanding immediate and intelligent attention. And by Sir Frederick Treves, that "health is the essential factor in productiveness, prosperity and happiness, and hence in the advancement of civilization." And by Lord Beaconfield, that "Public Health is the foundation on which reposes the happiness of a people and the power of a country. The care of the public health, then, is the first duty of a nation." And by Mr. A. H. Eller, Chairman of the State Democratic Executive Committee of this State, that "the lives and health of the people stand first among all the duties which an enlightened State owes to a loyal citizenship. Grander conceptions of human worth demand that preventable diseases be subdued as the common enemy of all."

If all these things be true, and they are true, then who would dare minimize the importance, the work, the responsibility of the Health Officer? What town council, what Board of County Commissioners would dare tie the hands of their Health Officer by refusing to make a sufficient appropriation to enable him to carry this message of life, health, happiness and prosperity to all the people of his town and county? Who would dare suggest that a Health Officer do this most important work as a labor of love? Who would think for a moment that a matter of so great and far reaching importance would occupy less than the entire time and energy of the best man that could be procured?"

From address of President of N. C. State Health Officer's Association.

American Water Works Association.

At the thirty-second annual convention of the American Water Works Association, held in Louisville, June 3–8, resolutions were adopted urging upon boards of health the importance of ascertaining and recording the distribution of typhoid fever by causes and modes of infection, to the end that a division of responsibility may be made between water supply, contact cases, general sanitary conditions, milk and other food supplies liable to contamination and typhoid carriers. It was further resolved that boards of health be urged to do their full duty in the elimination of all causes of the spread of typhoid fever.

Extension of the Idea of Sickness and Accident Insurance.

Those who have been watching with close interest the operation in Germany of the Workman's Sickness and Invalidity Compulsory Insurance, as incorporated in 1882 and the strenuous opposition to some of the features of Mr. Lloyd George's Bill of a similar sort recently passed through the Parliament at London, will be interested in the further extension of the principle in a direc-

tion which has surely never occured to us on this side of the Atlantic.

In a popular referendum in February 1912, the Federal law passed by the Legislature of the Swiss Cantons in June 1911 was approved by the people by a majority of 48,000 in some 500,000 votes. The Bill is very complete, dealing (a) with the Constitution of the National Swiss Accident Insurance Society (b) with assistance of Societies in cases of sickness (c) with compulsory insurance (d) with voluntary insurance.

The special federal insurance fund, that must be exclusively devoted to sickness and accident insurance amounted at the end of 1911 to 40 million francs, while the estimated charges against the fund are estimated at about 8 millions. The total number entitled to the benefits will be 700,000 persons—550,000 compulsory and 150,000 optional. Under the law mutual societies are the especial type of organization and for the farmers, the chief benefit is the provision of a doctor as "the Society obtains the doctor's services cheaper than the farmer could." The law extends the benefit to women at confinement and to mother and child for a period of nine months thereafter. Regarding the relation of the doctor and the societies the law lays down the rule of limited free choice amongst the doctors of the neighborhood where no exclusive bargains do not exist with certain doctors exclusively. Federal assistance from the fund is proportioned to the benefits assured by the mutual societies. Of special importance is the provision in encouraging societies being formed in the high mountain cantons, where doctors are few. Special grants are given where a commune succeeds in getting a doctor to live in the valley and attend the sick. This may be extended by giving a distant doctor special traveling fees according to distance. The special report further states that this grant may take the form of subventions for laying a rural telephone to sparse settlements.

Such illustrations of advanced legislation in different European countries seems at first foreign to our American ideals; but with a rural population in Canada and the United States of nearly 50% of the total, it is plain that the problems of organized aid cannot be evaded. In the matter of tuberculosis, it has a splendid and rapid evolution and in nothing else can it find so directly favorable a field as in the various methods now being developed for lessening infant mortality. Perhaps it is not very necessary as yet in the well-to-do rural districts of the United States and Canada; but even in those in some parts as amongst the Negroes and Indians and in the mountains of Mexico, organized medical assistance will prove one of the most potent factors in the saving of the young lives of the natives.

P. H. B.

Association for Study and Prevention of Infant Mortality.

The transactions of the second annual meeting of the American Association for the Study and Prevention of Infant Mortality has recently been issued. The volume consists of 418 pages and contains papers on Eugenics, Continuation Schools, Milk Supply, Housing, Midwifery, Nursing and Social Work. Most of the persons who have been specially identified with infant saving work have contributed. This book should be in the hands of all Health Officers as they will find much in it which will be of assistance to them in their efforts to curtail the infant morbidity and mortality in their communities. The transactions can be obtained by addressing the American Association for Study and Prevention of Infant Mortality. 1211 Cathedral Street, Baltimore, Maryland. The cost of the volume is $3.15 including postage.

Traveling Library.

The State Department of Health established a traveling library for the health officers about a year ago, and the applications for sets of books soon exceeded the supply, and the notice concerning the traveling library was omitted from the Monthly Bulletin. All requests for the books have now been complied with and several sets are at present on hand and the State Department of Health will be pleased to have them used

by health officers. Each set consists of six books, viz.: Diseases of the Skin and Eruptive Fevers, by Schamberg; General Bacteriology, by Jordan; Pulmonary Tuberculosis, by Pottenger; Principles of Sanitary Science and Public Health, by Sedgwick; Sewage Disposal, by Kinnicutt, Winslow & Pratt; and Water Supply, by Mason.

Monthly Bulletin, New York State Dept., of Health, June, 1912.

The Prevention of Dental Caries.

By Dr. J. Sim Wallace. Second Edition. London: Published at the Office of *The Dental Record*, 1912. Price, 1s. 6d. net.

"The appearance of a second editon of this book within a few months of its first appearance is evidence that is has attracted considerable attention. This is not surprising, for dental caries is a subject in which most persons are interested, and Dr. Sim Wallace has some important things to say about it. He maintains that 'the cause of caries is the prolonged retention or stagnation of fermentable carbohydrates in more or less immediate contact with the teeth, and undisturbed by the free access of saliva.' The usual preventive measures advocated, antiseptic mouth-washes, tooth-brushing, and tooth-powders, he considers are of little avail, being ineffective as cleansing agents, and possibly productive of harm. Dental caries, he holds, can only be prevented by a proper choice of diet. Food, particularly the food of children, should be of such consistency as to require vigorous mastication. Efficient mastication keeps the mouth physiologically clean and the teeth and gums strong and healthy, and there is no other really effective way of prevention. Such is the teaching of Dr. Sim Wallace, and we strongly recommend this suggestive and stimulating book to all medical practitioners, and especially to those engaged in the practice of preventive medicine."

Public Health, Vol. XXV, No. 9.

Insects.

Insects— The common Forms in Relation to Public Health; Methods for Their Destruction—is the title of an up-to-date and useful bulletin issued this year by the Pennsylvania State Department of Health. The insects discussed are the mosquito, the common fly, the flea, the cockroach, the bed-bug, the house ant, various varieties of lice, and the itch mite. The life history of each insect is outlined and the latest practicable methods of combating it are presented.

Pennsylvania Health Bulletin, No. 32, Feb. 1912.

The Organism of Typhus Fever.

"In the *Zeitschrift für Hygiene und Infectionskrankheiten*, Vol. 70, 1912, Dr. Fuerth gives an account of an investigation into the nature of the infective agent in typhus fever. The author took the opportunity of a small outbreak of typhus fever among Chinese coolies and some Europeans in Tsingtau, which borders on the province of Shantung in China, to make some investigations into the infective agent of this disease.

This is a district which is somewhat liable to be invaded by typhus, for there was a considerable outbreak (over 300 cases) in 1899, but only occasional cases till Spring 1911. The cases comprised 15 Europeans and 50 Chinese coolies. It apparently started among the Chinese, the condition of overcrowding and dirt, in which they more or less habitually live, favouring its spread. The symptoms and clinical aspects of the disease did not differ from those with which we are familiar, except that among the Chinese they were much milder and ran a more favourable course than among the Europeans, the case mortality of the former being only 11 per cent against 33 per cent for the latter.

Very full bacteriological inquiries were made into the cases, and inoculation experiments were carried out on apes, rabbits and rats, and the following is a summary of the results obtained. In 38 per cent of the cases a diplo-bacillus was found in the blood and organs by means of staining and cultural methods. In a series of cases they got pure cultures. The organism was short and thick and altered a good deal in form when planted on different nutrient media. When grown

on agar and tested biologically it resembled strepto-coccus pyogenes, so that you might imagine you were dealing with a form of this organism or a subspecies, though it differed in microscopical characters and in its growth in milk and its affinity for Gram's stain. It resembled the bacteria found in some previous observations in earlier epidemics in various places, especially in the method of demonstrating its presence, as well as in its morphological and cultural characters. The best time to find the organism in the blood was found to be late in the illness, 2 to 4 days before defervescence, and examination of blood by staining thick drops gave a good result. A much better result could be obtained by adding ascetic fluid and glycerine to the media used, whether they were solid or liquid. If this is not done, you very often get no growth. The media should also be weakly alkaline. Agglutination does not seem to have been a constant phenomenon, but occurred in some cases in dilutions of 1:40 and 1:60. Pure cultures were not very pathogenic when injected subcutaneously and intraperitoneally into apes, rabbits and rats, and they lost their virulence on continued transplantation. Subcutaneous and intraperitoneal injections of blood from typhus cases into apes (*Macacus rhesus and Macacus cynomolgus*) produced a feverish illness after 10 to 14 days incubation, which lasted 5 to 7 days continuously and made the animals appear ill. In two of the apes they succeeded in recovering the diplo-bacillus in pure culture from the organs of the body during the first few days of fever, i.e., 12 to 13 days after inoculation.

The authors are not quite sure whether this organism is the cause of the disease or a secondary infection, but they are inclined to think that it is probably the cause, but hope further investigations will be undertaken."

Public Health, July, 1912.

New York Fly Fighters.

"A squad of policemen are to be assigned to the Health Department to assist in making war on the fly. It is a violation of the sanitary code to leave a garbage can uncovered and the policemen are to see that this section of the code is obeyed; if it is too frequently disobeyed arrests are to be made. It is pointed out very emphatically that the co-operation of the public is desired in fighting the fly nuisance."

Jour. A. M. A., July 6, 1912.

Typhoid in Cincinnati.

An investigation of the probable source of infection in 55 cases of typhoid fever, occurring since the first of the year, reveals some interesting facts.

Particular attention is given to the water and food supplies, especially milk, to contact with other cases and to the method of sewage disposal.

Twelve drank unfiltered river water. Eight drank from cisterns, 3 from wells, 2 from springs, and 26 from filtered water.

One had been in contact with a typhoid patient during the period of incubation. Three are still under investigation.

In 38 cases the sewage disposal was by privy vaults, cesspools, or even more primitive methods.

Over 90 per cent of the houses in the city are supplied with filtered water.

Less than 10 per cent of the domestic water supply (cisterns, raw river water, and springs) furnishes 50 per cent of our typhoid. In other words, the attack rate per 100,000 of population using filtered water for the first five months is 7.87, while for those using other sources of supply the attack rate is 70.3, or almost ten times as great.

This is entirely too high. The only way to stop it is to extend the water mains and compel property owners to make connections.

Between one-third and one-half of the houses are connected with sewers, or 34,500. At the rate sewer connections are being made, many years must pass before even one-half the city disposes of its sewage properly.

In the above cases, the water supply seems to be of vastly greater importance as a causative factor than any other source investigated.

People contemplating a trip out of the city to some place where little or nothing is

known concerning the purity of the water should submit to typhoid vaccination before doing so.

This proceeding has passed the experimental stage, protects against typhoid as certainly as does vaccination against smallpox, and should be done by the family physician. All people exposed to the possibility of contact infection should be immunized.

Those unable to employ a family physician can receive the treatment by applying to the Health Department.

Weekly Bulletin, Board of Health, Cincinnati, Ohio, June 8, 1912.

The Waiter's Napkin.

"It is strange that people otherwise very particular as to how they eat and drink, as well as what they eat and drink, should submit to a number of unpleasant, not to say unsavoury, accompaniments when they partake of food in public places, which they would not tolerate in their own homes. It is certainly a remarkable tribute to the omnipotence of the waiter that such things should be. Take, for example, that functionary's napkin, which is used for a variety of purposes other than to give the official brush up to one's plate which is so ceremoniously performed. We have seen this soiled piece of napery made use of by a waiter—in the intervals of serving his customers—quite impartially, whether it was to dust his trousers, or his boots, or even to wipe his perspiring forehead, and on more than one occasion to wipe his nose! A moment later he is perhaps rubbing the plate of a patron with this same napkin, which, when not being employed in any of the multifarious duties outlined above, is generally reposing in orthodox fashion in the armpit of a dusty and probably greasy evening coat. It is very little better to have one's soup handed to one after gently laving the visibly dirty thumb of the average waiter. True there have been sporadic attempts made to introduce the use of white cotton gloves, but the impossibility of keeping these for even a few hours in a state in any degree approaching their pristine purity is obvious. Whilst we need not allow our imagination to run riot as to what may occur in the average hotel or restaurant kitchen, it is surely not too much to expect cleanliness in the actual serving of food. Certainly these and similar little unsavoury details are worthy of the attention of the public purveyors of food, for although for the most part people endure them uncomplainingly, for some of us undoubtedly they 'cloy the hungry edge of appetite.'"

British Medical Journal.

Dangers of Swimming Baths.

"The multiplication of public swimming baths has been rendered necessary by the great growth of the industrial centers in this country. The swimming pools in many rivers which where used by former generations have become, in many instances, so polluted with trade effluents and other matters that they have been entirely abandoned. Some of the earliest public baths to be constructed were unroofed and had a constant stream of water flowing through them, but their increased number and other considerations have made it necessary to economise the water supply, so that at the present time it is the custom to change the water only once or twice weekly. This being so, there is a danger of the baths becoming almost as polluted as the swimming pools of former days. Many efforts have been made, more or less successfully, to purify the water of swimming baths. The best known method of purification is, perhaps, that of Dr. Alexander, the medical officer of health of the metropolitan borough of Poplar, who for some time has made use of the electrolytic disinfectant fluid which he persuaded the borough council to manufacture some years ago. The fluid is placed in the public swimming baths in Poplar on successive days, and has been found both by chemical and bacteriological examination to purify the water very satisfactorily. In addition to the actual purification the water is far pleasanter to bathe in, is clear and invigorating, and free from the usual unpleasant odour associated with public baths.

In order to ascertain the effect upon the water of swimming baths of its constant use,

Dr. J. Graham Forbes recently made an examination of the water in the small swimming bath at the London County Council industrial school in Goldsmith Street, Drury Lane. The result of this examination he reported to a meeting of the Medical Officers of Schools Association in February last. He found that there was evidence of skin contaminations shown by the presence in the water examined of *Staphylococcus pyogenes aureus*, *Epidermidis albus* and members of the *proteus* group; of organisms present in normal saliva and of faecal contaminations which largely predominated in the form of members of the *proteus* group, *B. coli communis*, *B. pyocyaneus* and *Streptococcus faecalis*. The results of Dr. Forbes' investigations are in accord with those of other observers and point to the necessity for definite action being taken by local authorities who have the control of public swimming baths. Dr. Alexander has apparently been successful in finding a remedy for the unsavoury and dangerous conditions shown to be associated with public baths, so that there should not be much difficulty in doing elsewhere what has been accomplished in the borough of Poplar. The advantages connected with free facilities for bathing and for swimming are so evident that it would be a pity if the researches of chemists should bring them into disrepute."

The Medical Officer, June 29, 1912.

Carbon Monoxide from Slow Combustion Stoves.

Dr. H. W. Sinclair, the School Medical Officer of the Essex Education Committee contributes a short article on the heating of school rooms by the use of slow, closed, combustion stoves, burning coke, in the June 29 issue of the *Medical Officer*. The results of the investigation are summarized as follows:—

Our experiments prove that under certain conditions it is possible to detect in the air of rooms heated by slow combustion stoves a very small amount of carbon monoxide gas. The maximum amount even under such favourable conditions for the accumulation of the poisonous gas as existed in Series I., II., and III. of our estimations—namely the overheating of the stove and the absence of ventilation—did not exceed one part in 66,000. It is true that carbon monoxide is very poisonous, and that, even if only small amounts are present in the air, headache and loss of flesh may occur in persons exposed to the contaminated atmosphere for long consecutive periods.

In the *Journal of Physiology* (1886) Professor Haldane states that toxic symptoms were shown by persons when the carbon monoxide figures reached one part in 2,000. It is certain that the amounts found by us are so small as to be negligible as a possible cause of ill-health—since we found that under no circumstances of insufficient ventilation, etc., did the amount of carbon monoxide exceed one part in 30,000. In fact, the low readings of carbonic acid present in the air of unventilated stove-heated rooms establish the fact that the aspirating effect of the flue effectually causes the removal from the stove of the products of combustion. It is interesting to note further that, although the investigators were personally exposed for considerable periods to a temperature of about 90° F. in unventilated classrooms, we felt no bad effects that might be attributed to the stoves.

Is Baked Bread Sterile?

"In the *Zeitschrift für Hygiene und Infectionskrankheiten*, Vol. 69, 1911, there is an interesting article by B. von Fenyvessy and L. Dienes on the question whether bread is sterilized in the process of baking. It is usually assumed that the high temperature to which the dough is submitted insures this, various statements being to the effect that the inside of the loaf reaches 101° to 102° or more, the further assumption being that ordinary infectious diseases cannot be transmitted in this way.

"These two authors, therefore, set themselves to ascertain exactly what internal temperature loaves reach in the baking oven, and what class of organisms survive. After several experiments they concluded that (1) the internal temperature reached varied from 94° to 104°; (2) that non-sporing path-

ogenic organisms which gain entrance accidentally into the dough are certainly killed; and that (3) dough contains mostly spores (of fungi) which are not killed by baking, and that it is therefore certainly not sterile. It is always possible that pathogenic organisms which produce spores may by means of these survive the baking process. It appears that so far no case of infection is recorded as having taken place this way."

Public Health, July, 1912.

Valuable Co-operation.

Commissioner Lederle has received and accepted, on behalf of the Department of Health of New York, an offer from the Committee for the Reduction of Infant Mortality of the New York Milk Committee to render valuable assistance to the Department of Health in the conduct of the work of the infants' milk stations. Under the plan of co-operation which has been arranged, the medical members of the Committee for the Reduction of Infant Mortality will visit the Municipal Infants' Milk Stations from time to time and make reports to the Department of Health in regard to the conduct of the work, and will give constructive suggestions for such improvements in methods as seem to them advisable. These reports will be submitted to the Department of Health in writing and will be followed by personal conferences if necessary.

The Committee will also render active assistance in the supervision and checking up of the records of the milk stations and collecting data for the purpose of reports and public statements. It will assign one or more persons capable of doing this statistical work and will actively co-operate with the Department of Health in the accumulation of useful and accurate data which may be made available periodically for the purpose of improved control of the work and the promotion of the highest efficiency.

The New York Milk Committee has already provided an Executive Secretary for the recently established Babies Welfare Association, the object of which is to bring about the highest possible degree of co-operation between private agencies and the Health Department in the work of reducing infant mortality. In addition to the services rendered by this Executive Secretary, the Committee will further assist the Department of Health in preparing material for publication and in carrying out plans for public meetings and exhibits of an educational nature.

Scientific Research for the Local Government Board.

"The President of the Local Government Board has authorized the following special researches to be paid for out of the annual grant voted by Parliament in aid of scientific investigations concerning the causes and processes of disease.

1. Further investigations (a) as to the distribution of tubercle bacilli in children having died between the ages of two and ten years, and the special characteristics of such bacilli; and (b) in collaboration with the General Register Office, on the incidence of different forms of tuberculosis in different parts of the country, according to age, sex, occupation and other conditions.

2. A continuation of a research into the causes of premature arterial degeneration in man by Dr. F. W. Andrewes, of St. Bartholomew's Hospital.

3. A joint investigation into the virus of poliomyelitis by Drs. F. W. Andrewes and H. M. Gordon, of St. Bartholomew's Hospital.

4. A continuation of an investigation into the micro-organisms known as non-lactose fermenters occuring in the alimentary canal of infants by Dr. C. J. Lewis, of Birmingham University, Dr. D. M. Alexander of Liverpool University, and Dr. Graham-Smith, of Cambridge University.

5. A continuation of the investigation by Professor Nuttall of Cambridge University on fleas and on the range of flight of the domestic and allied flies."

Public Health, July, 1912.

The Plague Situation in Porto Rico.

"On the request of the governor of Porto Rico the Public Health and Marine-Hospital Service has taken charge of the plague

eradicative work in San Juan and vicinity in co-operation with the local sanitary authorities. Passed Assistant Surgeon R. H. Creel, an officer experienced in the laboratory and field work of plague eradication, has been placed in immediate charge. Officers have been detailed for plague duty in Porto Rico, and additional officers are on their way to San Juan.

The work being carried on includes the limitation of the disease to the island of the old city of San Juan. Measures are being taken to prevent the escape of rats across the bridges and also to prevent the possibility of their gaining access to vessels. The city has been divided into districts, and the houses in the infected territory are inspected daily. Infected houses are surrounded by rat-proof fences and then disinfected and freed from rats or destroyed. Special attention is being paid to the care and collection of garbage and other material which may serve as rat food. Steps are being taken toward the rat proofing of the entire water front. Trapping and poisoning of rats is being done. Special attention is being given to the laboratory examination of rats caught in parts of the city not known to be infected, in order to outline definitely the infected areas.

All the human cases with the exception of 8 have occurred in the old part of San Juan. Of the 8 occurring outside of the old city, 5 were in Santurce, a suburb of San Juan; 2 at Carolina, a town about 15 miles away, and 1 occurred at Arroyo, on a small schooner from San Juan. Of 4 rats caught in one of the houses at Santurce, in which a plague case occurred, 2 were found to be plague infected.

To prevent the further spread of the disease vessels clearing for other ports in United States territory have been made subject to the restrictions contained in paragraphs 35 to 40, inclusive, of the Quarantine Regulations promulgated October 20, 1910. This outgoing quarantine is being maintained with the assistance of the revenue cutter *Algonquin*.

Passed Assistant Surgeon Creel reports July 2: Two cases plague in Santurce July 1. Total to date: San Juan, 21 cases, 13 deaths; Santurce, 5 cases, 2 deaths; Carolina, 2 cases, 2 deaths."

Public Health Reports, July 5, 1912.

The Danger of Petrol in Sewers.

"A grave warning under the head of 'Petrol in Sewers—a Modern Danger,' has been issued by the Manchester Rivers Committee regarding the discharging of petrol or other kindred spirits into sewers. The increasing use of petrol for motor vehicles, as well as for purposes of cleaning fabrics of various kinds, is occasioning a state of things to which it is important that public attention should be drawn. Instances are given where serious loss of life, both in Manchester and elsewhere, has occurred from the ignition of the very inflamable vapour discharge from petrol. It has been calculated that one gallon of petrol if vapourised into air, will produce something like 50 cubic yards of explosive mixture. A medium sized sewer, running half full would only require a gallon of petrol to produce sufficient vapour to blow up some 50 yards of the sewer. In these circumstances it is of the highest importance that the greatest care should be taken not only by the users of petrol in quantity, such as the proprietors of motor garages, etc., but also by the general public to avoid the discharge of even minute quantities of petrol or allied spirits into the sewers or drains, as these small quantities are liable to accumulate in gullytraps and in any portions of the sewers where the flow is inclined to be sluggish. No more petrol should be used at one time than can be spontaneously evaporated without nuisance or danger. It is dangerous to put even a cupful of petrol down the sewers, because it accumulates and very soon becomes a dangerous quantity. In New York the danger has become acute. The committee is contemplating putting up notices in all garages and elsewhere in order that the danger may be known."

The Lancet, Vol. I, No. XXIV.